

MINISTRY OF DEFENCE OF UKRAINE
MILITARY ACADEMY (ODESA)

**EDUCATIONAL PROGRAMME OF THE COURSE
OF PROFESSIONAL MILITARY EDUCATION**

***PROFESSIONAL COURSE OF TACTICAL LEVEL FOR LOGISTICS FORCES
(MILITARY AUTOMOTIVE EQUIPMENT), L-1B (MAE)***

**Military Accounting
Specialty**

*706200 "Operation and Repair of Automotive
Equipment and Its Analogues"*

APPROVED

by the Academic Council of the Military
Academy (Odesa) (protocol dated " ____"
____ 20_ No._)

Head of the Academic Council
Military Academy (Odesa)
Major General

Andrii KOVALCHUK

Put into effect by Order of the Commandant
of the Military Academy (Odesa) dated " __"
____ 20_ No.

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**LETTER OF AGREEMENT
OF THE EDUCATIONAL PROGRAMME
OF THE PROFESSIONAL MILITARY EDUCATION COURSE
PROFESSIONAL COURSE OF TACTICAL LEVEL FOR LOGISTICS
FORCES
(MILITARY AUTOMOTIVE EQUIPMENT), L-1B (MAE)**

for the military speciality *706200 " Operation and Repair of Automotive
Equipment and Its Analogues"*

APPROVED

Director of the Department of Military
Education and Science, Ministry of
Defence of Ukraine

Volodymyr MIRNENKO
" ____ " _____ 20

APPROVED

Head of the Central Directorate of
Military Education and Science of the
General Staff of the Armed Forces of
Ukraine
Colonel

Oleh PAVLOVSKYI
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APPROVED BY

Commander of the Logistics Forces
of the Armed Forces of Ukraine
Brigadier General

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Developed and submitted by

Chairman of the working group
Chief of the Central Military Equipment
Supply Department of the Armed Forces
Logistics Command of the Armed Forces
of Ukraine
Colonel

Andrii YAKOVENKO
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FOREWORD

Developed by the working group of the Logistics Forces Command of the Armed Forces of Ukraine and the Military Academy (Odesa).

Order of the Commander of the Logistics Forces of the Armed Forces of Ukraine dated " ____ " _____ 2024 № ____.

Head of the working group

Andrii YAKOVENKO – Colonel, Head of the Central Directorate for Providing Military Equipment, Armament of the Logistics Forces Command of the Armed Forces of Ukraine.

Members of the working group:

Oleksandr LYSYI – Colonel, Candidate of Technical Sciences, Associate Professor, Head of the Department of Automotive Equipment, Faculty of Training Specialists in Support and Operation of Military Equipment, Military Academy (Odesa);

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Volodymyr MELNYK – Colonel, Head of the Department of Repair and Operation of Automotive and Special Equipment, Faculty of Training Specialists in Support and Operation of Military Equipment, Military Academy (Odesa).

CONSIDERED:

1. Professional Standard for Tactical Level Officers of the Armed Forces of Ukraine.
2. Feedback from internal and external stakeholders.
3. Proposals from learners.
4. Experience of conducting combat operations.

1. PROFILE OF THE EDUCATIONAL PROGRAM PROFESSIONAL MILITARY EDUCATION COURSE

1 - General information	
Full name of the military higher education institution	Military Academy (Odesa)
Title of the document on completion and scope of the educational programme of the professional military education course	Certificate of Completion of the Course “Tactical Level Specialized Course for Logistics Forces (Military Automotive Equipment), L-1B (MAE), under MOS 706200”. Program Scope: 27 ECTS credits.
Prerequisites	Possession or pursuit (for cadets) of a higher education degree not lower than a bachelor’s; completion of the Basic Tactical Level Course L-1A; for military personnel: service as enlisted, non-commissioned, or warrant officers; for civilians: fitness for military service in the Armed Forces of Ukraine based on health status.
Language(s) of instruction	Ukrainian (English)
Duration of the educational programme for the professional education course	Until the update or introduction of a new educational programme.
2 - Objectives of the educational programme	
Training of qualified officers at the tactical level who are competent in managing the operation of military equipment and capable of performing assigned tasks.	
3 - Characteristics of the educational program	
Subject area	Field of Knowledge: “25 Military Sciences, National Security, State Border Security”; Specialty: “255 Weapons and Military Equipment”; Specialization: “Military Automotive Equipment”. Field of Knowledge: “27 Transport”; Specialty: “274 Automotive Transport”; Specialization: “Automobiles and Automotive Management”.
Main focus of the professional military education course program	Professional military education for service in typical positions defined in the professional standard for tactical level officers.
Features of the programme	The educational program is developed based on the educational program of the Basic Tactical Level Course L-1A, approved by the Chief of the General Staff of the Armed Forces of Ukraine on 29.06.2024, No. 97672/S, and incorporates current combat experience gained during the Anti-Terrorist Operation, the Joint Forces Operation, and the defence against the full-scale invasion of the Russian Federation into Ukraine.
4 - The employability and further education prospects of graduates	

Employability	<ul style="list-style-type: none"> • Commander of a repair platoon in a repair company for automotive equipment of a military unit; • Commander of an automotive platoon in an automotive company of a military unit; • Deputy company commander for armament.
Further education	Training under the educational program of the Professional Military Education Course “Command Course at the Tactical Level for Logistics Forces (Military Automotive Equipment), L-1C (MAE)”.
5 - Teaching and Assessment	
Teaching and learning	The main types of instructional activities used for delivering the components of the educational program include: Lectures; Seminars, Group Sessions, Practical Sessions, Group Exercises; Tactical Exercises (including Tactical-Formation Exercises and Tactical-Special Exercises), and Independent Work, including at the field training base.
Assessment	The assessment of learners’ outcomes includes the full range of evaluation measures outlined in the curricula of academic disciplines and is conducted using a 100-point scale, the ECTS scale, and the national scale.
6 - Programme Competencies	
Military-Specialized Competencies (MSC)	MSC-1: Ability to apply knowledge of the structure, design, and operating principles of assemblies, components, mechanisms, systems, and devices of automotive equipment to ensure its proper operation and repair.
	MSC-2: Ability to ensure the functionality, reliability, and durability of engines and to understand the essence of processes occurring in their systems and main mechanisms.
	MSC-3: Ability to apply knowledge of the structure and operating principles of electronic and microprocessor equipment, systems, and devices of electrical and electronic equipment in military vehicles.
	MSC-4: Ability to address a range of technical malfunctions using standard diagnostic tools for systems and mechanisms (components and assemblies) of automotive equipment.
	MSC-5: Ability to conduct technical maintenance of military automotive equipment, implement measures for organizing its operation, and assess its technical condition.
	MSC-6: Ability to identify and classify hazardous factors in the operation of automotive equipment.
	MSC-7: Ability to monitor the technical condition, usage, and safe and accident-free operation of equipment, and to possess knowledge for determining directions for the efficient use of natural resources, energy, and materials during operation.
	MSC-8: Ability to master technologies and organizational forms for diagnostics, technical maintenance, and repair of equipment.
	MSC-9: Ability to organize and conduct vehicle driving training sessions.
7 - Programme learning outcomes.	
Professional training (LOmpt)	LOmpt-1: Know and understand how to analyse processes occurring in military automotive equipment, identify malfunctions and failures, and, if necessary, perform technological actions to ensure proper operation.
	LOmpt-2: Know and understand the requirements for internal combustion engines in terms of ensuring their functionality, reliability,

	and durability, and identify the causes of malfunctions and failures leading to operational breakdowns.
	LOmpt-3: Apply acquired knowledge and understanding to analyse and evaluate processes in electrical circuits and electronic devices of military vehicles, and use various instruments for their diagnosis and timely troubleshooting.
	LOmpt-4: Apply acquired knowledge and understanding of physical processes and phenomena occurring in systems and mechanisms (assemblies and components) of vehicles, assess their technical condition, and find appropriate solutions with clear definitions.
	LOmpt-5: Apply acquired knowledge and understanding of the main principles of operating military automotive equipment, direct activities toward their implementation, evaluate, analyse, systematize, and find correct solutions for measures related to the operation of military automotive equipment in various conditions.
	LOmpt-6: Apply acquired knowledge and understanding during the assessment of the technical condition of automotive equipment to ensure accident-free operation.
	LOmpt-7: Possess sufficient knowledge to organize and monitor the technical condition, usage, and safe and accident-free operation of military automotive equipment, and to organize repair work, maintenance of assemblies, systems, and components of various purposes during operation.
	LOmpt-8: Possess sufficient knowledge to analyse necessary information, technical data, indicators, and performance results of assemblies and components of automotive equipment.
	LOmpt-9: Organize and conduct vehicle driving training sessions with unit personnel.
8 - Resource support for programme implementation	
Staffing support	<p>Academic staffs involved in the educational programme are full-time employees of the Military Academy; some of them have academic degrees, academic titles and a proven level of scientific and professional activity. Professional competences are developed by professionals with professional experience.</p> <p>The practice-oriented nature of the educational programme involves the wide participation of practitioners who are relevant to the programme, which enhances the synergy between theoretical and practical training.</p> <p>The head and members of the working group on the development of the programme, as well as the teaching staff that ensures the implementation of the educational programme meet the requirements set by the Ministry of Defence of Ukraine</p>
Material and technical support	<p>To achieve the competencies and learning outcomes specified in the educational program, the material and technical facilities of the Military Academy (Odesa) and the Centre for Supporting the Educational Process of the Military Academy are utilized. The material and technical support meets the requirements for providing educational services and is sufficient to ensure the quality of the educational process, including: classrooms; computer labs; specialized laboratories; sports halls and grounds; library and reading room; multimedia equipment; facilities for academic and teaching staff; barracks; dining facilities, and more.</p>

<p>Information and educational-methodological support</p>	<p>The educational and methodological support is developed in accordance with current regulatory and legislative documents of the Ministry of Education and Science of Ukraine and orders of the Ministry of Defence of Ukraine, and includes the following materials:</p> <ul style="list-style-type: none"> Instructional and methodological materials for Practical Sessions; Educational and methodological materials for all types of instructional activities; Methodological guidelines for completing assignments (projects); Methodological guidelines for organizing Independent Work; Programs for all types of practical training; Diagnostic tools. <p>The educational process utilizes the library resources, including educational materials and methodological developments by teaching staff.</p> <p>The program is supported by the virtual learning environment of the Military Academy (Odesa), proprietary developments, textbooks, manuals, and other educational and methodological materials.</p> <p>The official website of the Academy (http://vaodesa.mil.gov.ua/) provides information on educational, scientific, and moral training activities, structural units, admission rules, and contacts. Users have access to all available library resources. The technological and material-technical support for the educational process is available.</p>
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2. THE LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAMME OF THE PROFESSIONAL MILITARY EDUCATION COURSE AND THE ALIGNMENT OF PROGRAMME COMPETENCIES AND LEARNING OUTCOMES WITH THE COMPONENTS OF THE EDUCATIONAL PROGRAMME

2.1. The list of components of the educational programme (EP).

Code of ac. disc.	Components of the educational programme (academic disciplines/modules).	Number of credits	Form of final control
MS 1.	Military automotive equipment (including automotive training)	3,0	Credit
MS 2.	Vehicles	6,0	Credit, Exam
MS 3.	Automotive engines	4,0	Credit, Exam
MS 4.	Technical operation of vehicles	9,0	Credit, Exam
MS 5.	Electronic and electrical equipment of vehicles	5,0	Credit, Exam
Total credits for the programme		27,0	

2.2 Alignment of programme competencies with components of the educational programme.

	MS 01	MS 02	MS 03	MS 04	MS 05
MSC-1		+	+		
MSC -2			+		
MSC -3					+
MSC -4		+	+	+	+
MSC -5		+			+
MSC -6				+	
MSC -7				+	
MSC -8		+	+	+	
MSC -9	+				

2.3 Alignment of learning outcomes with components of the educational programme.

	MS 01	MS 02	MS 03	MS 04	MS 05
LOmpt-1		+	+		
LOmpt-2			+		
LOmpt-3					+
LOmpt-4		+	+	+	+
LOmpt-5		+			+
LOmpt-6				+	
LOmpt-7				+	
LOmpt-8		+	+	+	
LOmpt-9	+				

3. DISTRIBUTION OF COMPONENTS OF THE EDUCATIONAL PROGRAMME BY COURSES AND SEMESTERS

N	Code of academic discipline	NAME OF THE ACADEMIC DISCIPLINE (MODULE)	Semester Distribution		Number of ECTS credits	Number of hours						Independent Work	Distribution of Classroom Hours by Years of Study and Semesters												
			Exams	Credits		Total Workload	Contact hours			Assessment Activities	1st Year		2nd Year	3rd Year	4th Year										
							Total	including			Semesters														
			Lectures	Group Session Seminars				Practical Session, Laboratory Session	1		2		3	4	5	6	7	8							
																Number of Weeks per Semester									
1	MS 01	Military automotive equipment (including automotive training)	-	-	3	90	90	-	-	90	-	-	-	-	-	-	90	-	-	-					
2	MS 02	Vehicles	5	4	6	180	120	22	48	50	4	56	-	-	60	60	60	-	-	-					
3	MS 03	Automotive engines	-	4	4	120	80	16	22	42	2	38	-	-	45	75	-	-	-	-					
4	MS 04	Technical operation of vehicles	8	5	9	270	198	14	52	132	4	68	-	-	-	-	100	90	40	40					
5	MS 05	Electronic and electrical equipment of vehicles	6	5	5	150	100	8	42	50	6	44	-	-	-	-	60	90	-	-					
Total:					27	810	588	60	164	364	16	206	-	-	105	135	220	180	40	40					
Total number													-	-	105	135	220	180	40	40					
Number of hours per week													-	-	-	-	-	-	-	-					
Number of exams													-	-	-	-	1	1	-	1					
Number of differentiated credits (credits)													-	-	-	2	3	-	-	-					

4. PROGRAMMES OF THE COMPONENTS OF THE EDUCATIONAL PROGRAMME

MS 1. MILITARY AUTOMOTIVE EQUIPMENT (INCLUDING AUTOMOTIVE TRAINING)

1. General Objective of the Academic Discipline (Subject of Study):

Upon completion of the educational programme component, the learner should be able to:

know:

Procedures for organizing the preparation of unit base vehicles for marches and their technical maintenance;

Technical capabilities of Military Automotive Equipment and procedures for its use;

Specifics of driving it on rough and difficult terrain at maximum achievable speeds;

Procedures for overcoming various obstacles and barriers, extricating vehicles when stuck, and towing;

Procedures for loading (unloading) equipment onto transport vehicles;

Procedures for organizing driving training sessions with subordinate personnel.

be able to:

Organize the maintenance of the proper technical condition of Military Automotive Equipment by ensuring correct vehicle operation, checking its technical condition, performing technical maintenance tasks, and addressing technical malfunctions that arise during operation without requiring disassembly of main mechanisms;

Prepare armament and military equipment before use, verify their availability upon return, and take measures to prevent breakdowns.

2. Organisational and Methodological Guidelines:

2.1. Features of the Teaching Methodology:

The teaching methodology for the academic discipline is based on the fundamental principles of didactics (the theory of justification and learning). It provides a scientific-pedagogical description of teaching forms and methods, identifies the most appropriate combinations to achieve the desired level of learning, and determines the conditions for their most effective use.

To achieve the main learning objective, the program includes the following forms of instruction:

Frontal instruction, where all learners, under the instructor's supervision, perform the same task simultaneously;

Group instruction, where learners are organized into groups (sections) based on the unit's staffing structure, working in parallel;

Individual instruction, where learners perform tasks sequentially, one after another.

Depending on the need to achieve specific levels of knowledge or skills, the instructor should use the following methods:

Verbal-visual method;

Training method;

Situational-cognitive method.

The **verbal-visual method** involves the instructor systematically and sequentially presenting the learning material, demonstrating the studied objects to provide learners with new knowledge and form relevant perceptions.

The **training (reproductive) method** involves performing complex actions according to a predefined algorithm set by the instructor to develop necessary skills and ensure the cohesion of military-organizational structures.

The **situational-cognitive method** involves reviewing and discussing real (or probable) actions, familiarizing learners with troop (force) management experience in military conflicts, and developing information-analytical skills.

The above methods provide learners with knowledge, skills, and abilities, but to foster their creative capabilities, the instructor should use problem-based learning methods.

Problem-based teaching involves the instructor posing a problem to learners, solving it, and demonstrating the solution process while explaining their reasoning. The immediate outcome of problem-based teaching should be the learner understands of the method and logic of solving a specific problem, though not yet the ability to apply it independently. This method teaches learners how to seek knowledge, helping them develop creative thinking skills.

The **search (heuristic) method** aims to gradually guide learners toward independently solving problems by pre-training them in performing individual elements of the solution. It is used during Group Exercises, where the instructor determines the approach to finding an optimal solution, but the learner finds the solution independently.

Problem-based methods ensure deep assimilation of knowledge at the level of creative application, mastery of creative thinking methods, and practical experience.

During Lectures:

A Lecture is the primary type of instructional activity designed for mastering the theoretical material of the topic.

The main objective of a Lecture is to provide systematized foundations of scientific knowledge and practical experience on the topic, outline the state and prospects of management science development, and cover the theory and practice of managerial activities of military leaders, focusing attention on the most complex and critical aspects of the learning material. The Lecture should be problem-oriented, stimulate active cognitive activity among learners, and promote the development of creative thinking. To activate learners' cognitive activity and foster creative thinking during Lectures, instructors should skillfully use technical teaching aids in combination with active forms and methods of lecture delivery. The session should be conducted through oral presentation of the material, with certain questions and learning elements practiced through dialogue between the instructor and learners and by posing problem-based questions.

During Group Sessions:

A Group Session is a type of instructional activity where the instructor uses the verbal-visual method to present new learning material, assesses learners' assimilation through questioning, and facilitates its consolidation.

Group Sessions aim to enable learners to study in detail the issues and problems discussed in Lectures and to thoroughly examine current aspects of the learning material. The primary teaching methods include explanation with demonstration and discussion-based conversations. To ensure visual clarity during sessions, technical information transmission tools, tables, diagrams, slides, films, and posters should be used.

During Practical Sessions:

A Practical Session is a type of instructional activity where the instructor organizes the assimilation of the topic's theoretical provisions through individual completion of specially designed tasks and fosters the development of skills and abilities for their practical application.

Practical Sessions should aim to consolidate and deepen the knowledge acquired by learners during Lectures, Group Sessions, and Independent Work, as well as to develop skills for solving practical tasks related to daily military activities.

During Group Exercises:

A Group Exercise is a type of instructional activity conducted by having learners perform the functional duties of designated personnel in military management bodies, military units, or subunits.

During these sessions, cadets (learners) acquire skills in organizing and planning combat (operations), managing troops, and ensuring their comprehensive support. Complex tactical tasks are developed for conducting Group Exercises.

During Independent Work:

Independent Work is conducted to practice and assimilate learning material; consolidate and deepen knowledge, skills, and abilities; prepare for subsequent sessions and Assessment Activities; and foster a culture of intellectual work, independence, and initiative in seeking, acquiring, and enriching knowledge among learners.

Independent Work should be supported by educational literature, manuals, assignments, and methodological recommendations. All instructional and methodological materials for sessions should have electronic versions. Methodological materials for Independent Work should provide opportunities for self-assessment.

2.2. Material and Technical Support:

Sessions should be conducted in specialized classrooms equipped with simulators and at designated driving training grounds using training vehicles.

2.3. Information and Methodological Support:

1. V.F. Kyslykov, V.V. Lutsyk. Structure and Operation of Vehicles: Textbook. 6th ed. Kyiv: Lybid, 2006. 400 p.
2. O.Ya. Fomenko. Driver's Manual. Kyiv: Ukrspetsvydav, 2015. 240 p.
3. O. Pavlyuk. Structure and Operation of Vehicles. 2013.
4. ZIL-131 Vehicle and Its Modifications. Technical Description and Operating Instructions. 322 p.
5. B.V. Yershov. ZIL-131 Vehicle and Its Modifications. 207 p.
6. KrAZ-6322-02, KrAZ-63221-02, KrAZ-6446-02 Vehicles. Operating Manual. Kremenchuk, 2007. 238 p.
7. O.A. Ludchenko. Technical Operation and Maintenance of Vehicles. Kyiv: Vyshcha Shkola, 2008.
8. Yu.F. Kyrylchuk. ZIL-131 Vehicle. Kamianets-Podilskyi, 2014.
9. Law of Ukraine "On Road Traffic". Kyiv: DTP, 1993.
10. Road Traffic Rules. Kyiv: Ariy, 2021. 160 p.
11. O.Ya. Fomenko. Road Traffic Rules: Illustrated Commentary. Kyiv: Ukrspetsvydav, 2015. 160 p.
12. Z. Derekh, V. Dushnyk. Road Traffic Rules with Commentaries and Illustrations. Kyiv: Ariy, 2015.
13. Z. Derekh. Thematic Tasks on Road Traffic Rules. Kyiv: Avtovisnyk, 2014. 215 p.
14. Z.D. Derekh, Yu.Ye. Zavorytskyi. Learning to Drive a Vehicle. 33 Lessons. Kyiv: Ariy, 2015. 60 p.
15. A. Tymovsky, V. Nesterenko. Basics of Vehicle Operation and Road Safety. Kyiv: Ariy, 2015. 160 p.

16. Z.D. Derekh, V.F. Dushnyk. Driver's Manual. Basics of Vehicle Operation. Kyiv: Ariy, 2008.
17. Commentaries on Road Traffic Rules. Kharkiv, 2019.
18. Criminal Code of Ukraine. Veles, 2002.
19. Code of Ukraine on Administrative Offenses. Svit, 2006.
20. Yu.A. Tymovsky, V.B. Nesterenko, A.A. Tymovsky. Medical Support for Road Safety. Kyiv: Ariy, 2015.
21. Medical Assistance. Kyiv: Ukrspetsvydav, 2015. 240 p.

Titles of Topics and Distribution of Study Time by Types of Academic Activities

№	Types of Academic Activities, Assessment Methods	Total Hours	Among them		Topic Title and Learning Questions
			Classroom Hours	Independent Work	
1	2	3	4	5	6
Section 7. Practical vehicle operation for category “C” vehicles.					
		2	2		Topic 1: Fundamentals of vehicle operation.
1	Practical session	2	2	-	<p>Lesson 1: Driver’s seating position. Familiarization and interaction with controls and signals.</p> <ol style="list-style-type: none"> 1. Driver’s entry into the vehicle. Familiarization with control and signalling systems, and control and measurement instruments. Correct hand positioning on the steering wheel and foot positioning on the pedals. 2. Adjustment of the seat, rear-view mirrors, seat belts, and headrests (if available). 3. Checking that doors are closed. Selective inspection of tire condition, steering, brakes, fluids (engine oil, coolant, windshield washer fluid, etc.), headlights, reflectors, turn signals, and audible warning signals. Inspection of the brake system with booster, steering system with booster, wheel condition, wheel nuts, mudguards, windshield, windows, wipers, fluids, and use of the instrument panel, including recording equipment. 4. Starting the engine. Monitoring the readings of control and measurement instruments. 5. Vehicle operation techniques. 6. Starting from a standstill, driving straight with gear shifting in ascending and descending order. Speed adjustment. Turning right and left, braking, and stopping. 7. Steering wheel turns to the right and left with both hands, including “hand-over-hand” technique, using the right or left hand, and increasing the number of steering wheel turns. 8. Interaction of control systems before starting movement, during movement in various gears with turns, slow and emergency braking, and stopping. Reversing. Turning in unrestricted and restricted spaces. Stopping and parking.
		5	5	-	Topic 2. Vehicle operation on a training ground.
2	Practical session	1	1	-	<p>Lesson 1: Preparation for departure. Inspection. Starting and low-speed movement.</p> <ol style="list-style-type: none"> 1. Preparation for departure. Vehicle inspection. Starting the engine and checking control and measurement instrument readings. 2. Starting from a standstill. 3. Low-speed movement.
3	Practical	2	2	-	Lesson 2. Movement at various speeds. Manoeuvring. Reversing.

	session				<ol style="list-style-type: none"> 1. Movement with gear shifting in ascending and descending order. Stopping. Straight reversing, reversing with turns, and U-turns. 2. Movement at various speeds. Straight movement with gear shifting. 3. Acceleration. Gear shifting in ascending and descending order. Downshifting without following a sequence, performing various types of braking (slow, emergency, intermittent). 4. Movement in different directions. Right and left turns. Movement between obstacles with right and left turns. 5. Reversing using various methods of road observation (through rear or side windows, open cabin doors, or rear-view mirrors). 6. Reversing with right and left turns in unrestricted and restricted spaces. Reversing along a wall, stopping, moving away from a wall, and uphill reversing.
4.	Practical session	1	1	-	<p>Lesson 3. Manoeuvring in restricted spaces.</p> <ol style="list-style-type: none"> 1. Driving onto and off a ramp in forward and reverse. Stopping during forward and reverse movement at 45° and 90° angles, between two parked vehicles, on a roadside, at a stop line, near a designated landmark, or road sign. 2. Manoeuvring in restricted spaces. Forward and reverse movement on a “track board.” Parking the vehicle in a designated spot or garage. Forward and reverse movement through a “dimension tunnel” straight and with turns. 3. Forward movement in a “figure-eight” and “snake” pattern. Entering a “dimension courtyard” straight and with turns, manoeuvring, and exiting. Stopping during forward and reverse movement near a designated curb, between two parked vehicles, on a roadside, at a stop line, near a designated landmark, or road sign. 4. Movement in areas with hazardous conditions (railway crossing with and without a barrier, intersections, public transport stops, sudden pedestrian appearance, etc.).
	Practical session	1	1	-	<p>Lesson 4. Movement at various speeds. Manoeuvring. Reversing.</p> <ol style="list-style-type: none"> 1. Starting from a standstill, acceleration, and gear shifting in ascending and descending order, stopping. 2. Straight movement, “figure-eight” pattern, manoeuvring in restricted spaces, turns, U-turns, and stopping at a designated spot. 3. Reversing manoeuvres, entering a garage. 4. Passing regulated and unregulated intersections and railway crossings. 5. Bypassing, overtaking, and oncoming traffic manoeuvres.
		6	6	-	Topic 3: Operating a Vehicle on Roads with Low Traffic Volume.
5.	Practical session	2	2	-	<p>Lesson 1. Straight movement. Intersection navigation. Manoeuvring.</p> <ol style="list-style-type: none"> 1. Straight movement while maintaining a safe distance and required speed. Stopping on the roadside and resuming movement. Passing intersections straight, with right and left turns. 2. Movement on roads with limited visibility, inclines, and descents. Stopping and starting from a standstill. Movement on bridges, overpasses, and in tunnels. Passing railway crossings with and without barriers. Bypassing, overtaking, and oncoming traffic manoeuvres. 3. Manoeuvring techniques at a fuel station.
6.	Practical session	2	2	-	<p>Lesson 2. Movement in traffic flow. Navigation of T-, V-, X-shaped intersections and squares. Manoeuvring.</p> <ol style="list-style-type: none"> 1. Operating a vehicle within a settlement. Movement in traffic flow. Manoeuvring on multi-lane roads. Bypassing

					<p>while maintaining safe distance and interval. Passing pedestrian crossings and public transport stops. Stopping near a curb and starting movement.</p> <ol style="list-style-type: none"> Exiting from a secondary road. Oncoming traffic manoeuvres on narrow road sections. Passing T-, V-, X-shaped intersections straight, with right and left turns. Navigating squares. Movement on roads with tram tracks, making right, left, and U-turns.
	Practical session	2	2	-	<p>Lesson 3: Navigating obstacles during forward and reverse movement on descents. Exiting onto a "Wedge".</p> <ol style="list-style-type: none"> Navigating obstacles during forward and reverse movement, alternating front and rear wheels on a descent and saddle, stopping in a dip, alternating front and rear wheels without braking, exiting onto a "wedge" with front wheels, and stopping at the top (two to three seconds).
		9	9	-	Topic 4: Operating a vehicle on roads with high traffic volume.
7.	Practical session	2	2	-	<p>Lesson 1. Movement in traffic flow. driving on ramps, curves, inclines, descents, bridges, overpasses, and in tunnels (1 hour – driving on the training ground at night).</p> <ol style="list-style-type: none"> Movement in traffic flow, exiting onto a secondary road. Entering a main road from a secondary road. Movement on ramps, curved road sections, turns, inclines, descents, bridges, overpasses, and in tunnels.
8.	Practical session	2	2	-	<p>Lesson 2. Movement in traffic flow. Overtaking, oncoming traffic manoeuvres. Passing railway crossings and public transport stops.</p> <ol style="list-style-type: none"> Overtaking and oncoming traffic manoeuvres on narrow road sections. Oncoming traffic manoeuvres on turns. Passing railway crossings, settlements, and public transport stops within their boundaries.
9.	Practical session	2	2	-	<p>Lesson 3. Movement in traffic flow within a settlement. Manoeuvring. Parking. Driving on one-way roads (1 hour – driving on the training ground at night).</p> <ol style="list-style-type: none"> Entering a road within settlements. Stopping near a curb and starting movement. Movement in traffic flow. Manoeuvring and overtaking vehicles. Passing pedestrian crossings and public transport stops. Stopping near a curb. Parking. Movement on one-way roads.
10.	Practical session	2	2	-	<p>Lesson 4. U-turns on roads. Navigating complex intersections. Manoeuvring at intersections.</p> <ol style="list-style-type: none"> U-turns on roads, overpasses, and in tunnels. Passing complex regulated and unregulated intersections. Navigating intersections in traffic flow, making right, left, and U-turns at intersections.
		8	8	-	Topic 5: Driving in special conditions.
11.	Practical session	2	2	-	<p>Lesson 1: Driving a vehicle in off-road conditions.</p> <ol style="list-style-type: none"> Driving a vehicle in off-road conditions. Transitioning to Unpaved Roads.
12.	Practical session	2	2	-	<p>Lesson 2. Movement on detour routes, oncoming traffic, and challenging terrains uphill, downhill, forest and other roads.</p> <ol style="list-style-type: none"> Movement on detour routes, oncoming traffic. Movement on sharp turns, ascents, descents, snow-covered, forest, and other roads.
13.	Practical session	2	2	-	<p>Lesson 3: Driving at night. Use of lighting devices. Driver actions in case of blinding.</p> <ol style="list-style-type: none"> Driving a vehicle at night. Entering a road with artificial lighting and without it. Use of lighting devices. Actions of the vehicle driver in case of being blinded by oncoming headlights.

	Practical session	2	2	-	Lesson 4. Towing a vehicle 1. Towing a vehicle. Coupling vehicles using rigid and flexible hitches while adhering to safety requirements. Checking the reliability of the coupling. 2. Towing a vehicle in a straight line, on turns, ascents, and descents. Stopping near a curb (on the roadside). Entering gates, uncoupling the vehicle.
		6	6	-	Topic 6: Improving driving skills.
14.	Practical session	2	2	-	Lesson 1: Manoeuvring in confined spaces and in reverse. Emergency acceleration and braking (1 hour – driving on a training ground at night). 1. Manoeuvring in confined spaces and in reverse. Complex and emergency manoeuvring. Emergency acceleration and braking.
15.	Practical session	2	2	-	Lesson 2. Manoeuvring on Roads with Heavy Traffic. Interaction with Other Road Users. 1. Manoeuvring on a road with heavy traffic. Interaction with pedestrians and other road users. 2. Manoeuvring, bypassing, overtaking, stopping, and starting movement.
16.	Practical session	2	2	-	Lesson 3: Driving a vehicle with a trailer. 1. Operating a vehicle with a trailer whose weight does not exceed 750 kilograms.
Section 8. Practical driving of category "C" vehicles.					
		2	2	-	Topic 1: Fundamentals of vehicle operation.
17.	Practical session	2	2	-	Lesson 1: Driver's station seating. Familiarization and interaction with control and indication systems. 1. Driver's Entry into the Vehicle. Familiarization with control and indication systems, dashboard instruments and gauges. Correct positioning of hands on the steering wheel and feet on the pedals. 2. Adjustment of the Driver's Seat. Adjust the seat to ensure a proper seated posture. Adjust the rear-view mirror, seat belts, and headrests (if applicable). Check that the vehicle doors are properly closed. Selective inspection of the condition of tyres, steering system, braking system, fluids (engine oil, coolant, windshield washer fluid, etc.), headlights, reflectors, turn indicators, and the horn. 3. Check the brake booster, power steering system, wheel condition, wheel lug nuts, mud flaps, windshield, windows, wiper blades, and fluid levels. Check and use the dashboard instruments, including any installed recording devices (tachograph or data recorder, if available). 4. Engine Start-Up. Observe the readings of dashboard instruments and indicators during and after starting the engine. 5. Basic Vehicle Control Techniques. Initial control techniques of the vehicle under static and dynamic conditions. 6. Starting Off and Driving in a Straight Line. Engage gears in ascending and descending order. Adjust driving speed. Execute right and left turns, braking, and stopping. 7. Steering Techniques. Turn the steering wheel right and left using both hands, including hand-over-hand method, and one-handed steering (left or right), increasing the degree of steering effort. 8. Interaction of Control Systems during Driving. Coordinate the use of vehicle controls before starting off and while driving in different gears, during manoeuvres, turns, slow and emergency braking, and halting. Driving in reverse. Execute U-turns under unrestricted and restricted road conditions. Perform vehicle stops and

					parking procedures.
		12	12	-	Topic 2. Vehicle operation on a driving range.
18.	Practical session	2	2	-	<p>Lesson 1: Preparation for departure. Control inspection. Movement at low speed.</p> <p>1. Preparation for departure. Control inspection of the vehicle. Starting the engine, checking the readings of the control and measuring instruments.</p> <p>2. Moving off the road. Driving at low speed. Driving with gear shifting in ascending and descending order. Stopping. Reversing straight ahead, turning and turning.</p> <p>3. Driving at different speeds. Driving in a straight line with gear changes. Acceleration. Shifting gears in ascending and descending order. Downshifting without observing the sequence of different types of braking (slow, emergency, intermittent).</p>
19.	Practical session	2	2	-	<p>Lesson 2. Movement in different directions. Movement in reverse.</p> <p>1. Movement in different directions. Turns to the right, left. Movement between obstacles with turns to the right and left.</p> <p>2. Reversing using different ways of following the road (through the rear or side window, open cab doors, using rear view mirrors).</p> <p>3. Reversing with right and left turns in unrestricted and restricted traffic. Reversing along the wall, stopping. Moving away from the wall. Reversing uphill.</p>
20.	Practical session	2	2	-	<p>Lesson 3. Manoeuvring in confined spaces.</p> <p>1. Entering and exiting the flyover in front and reverse.</p> <p>2. Stopping while driving in front and reverse, at an angle of 45 degrees, 90 degrees, between two vehicles located in a car park, on the roadside, in front of a stop line, near a certain landmark, road sign.</p>
21.	Practical session	2	2	-	<p>Lesson 4. Manoeuvring in confined spaces.</p> <p>1. Manoeuvring in restricted passages. Movement on the "track board" in front and reverse. Parking the vehicle in the parking lot, in the box. Driving straight and turning in a "dimensional tunnel", in front and reverse.</p>
22.	Practical session	2	2	-	<p>Lesson 5. Manoeuvring in confined spaces.</p> <p>1. Movement on the "figure eight", "snake", forward. Entry to the "dimensional yard" straight and with a turn, manoeuvring and leaving it.</p> <p>2. Stopping while driving in front and reverse near a conditional sidewalk, between two vehicles located in a car park, on the roadside, in front of a stop line, near a certain landmark, road sign.</p>
23.	Practical session	2	2	-	<p>Lesson 6. Driving in dangerous areas.</p> <p>1. Driving in areas where dangerous conditions are created (railway crossing without and with a barrier, intersection, stopping of route vehicles, sudden appearance of a pedestrian, etc.)</p> <p>2. Starting, accelerating and shifting gears in ascending and descending order, stopping.</p> <p>3. Driving straight ahead, in a figure eight, manoeuvring in tight spaces, turning, making U-turns, stopping in a designated place. Manoeuvring in reverse, entering a box. 4. Passing regulated and unregulated intersections, railway</p>

					crossings. Detouring, overtaking, and passing oncoming traffic.
		12	12	-	Topic 3: Driving on public roads with low traffic intensity.
24.	Practical session	2	2	-	Lesson 1. Driving in traffic flow. Stopping. Passing intersections. 1. Driving in a straight line while maintaining a safe distance and appropriate speed. Stopping at the roadside and resuming movement. 2. Passing through intersections by driving straight ahead, turning right, and turning left.
25.	Practical session	2	2	-	Lesson 2. Movement in traffic flow. navigating T-, V-, X-Shaped intersections and squares. Manoeuvring. 1. Movement on roads with limited visibility, ascents, and descents. Stopping and starting from a standstill. 2. Movement on bridges, overpasses, and in tunnels. 3. Navigating railway crossings with and without barriers. Bypassing, overtaking, and oncoming traffic manoeuvres. 4. Manoeuvring techniques at a fuel station.
26.	Practical session	2	2	-	Lesson 3. Movement in traffic flow. Manoeuvring. 1. Movement in traffic flow. Manoeuvring on a multi-lane road. 2. Bypassing and overtaking while maintaining safe distance and interval. 3. Navigating pedestrian crossings and public transport stops. 4. Stopping near a curb and starting movement. Exiting from a secondary road.
27.	Practical session	2	2	-	Lesson 4. Navigating T-, V-, X-shaped intersections and squares. 1. Oncoming traffic manoeuvres on narrow road sections. Navigating T-, V-, X-shaped intersections straight, with right and left turns. 2. Navigating squares. 3. Movement on roads with tram tracks, performing right turns, left turns, and U-turns.
28.	Practical session	2	2	-	Lesson 5. Overcoming obstacles during movement (1 hour – driving on a training ground at night). 1. Overcoming obstacles during forward and reverse movement, alternating front and rear wheels on descents and saddles, stopping in dips without braking, exiting onto a "wedge" with front wheels, and stopping at the top (two to three seconds).
29.	Practical session	2	2	-	Lesson 6. Manoeuvring in confined spaces (1 hour – driving on a training ground at night). 1. Manoeuvring in confined spaces. Driving along a "track board" forward and in reverse. 2. Parking a vehicle at a designated spot or in a garage. 3. Moving through a "dimension tunnel" straight and with turns, forward and in reverse.
		14	14	-	Topic 4. Driving a vehicle on a motorway with high traffic volume.
30.	Practical session	2	2	-	Lesson 1. Movement in the traffic flow. 1. Movement in traffic, exit to a secondary road. 2. Exit from a secondary road to the
31.	Practical session	2	2	-	Lesson 2. Driving on flyovers, rounded sections of the road. overtaking, oncoming traffic. 1. Driving on flyovers, rounded sections of the road, bends, ascents and descents, bridges, overpasses, tunnels. 2. Overtaking, passing oncoming traffic on narrow sections of the road. Passing oncoming traffic on bends.

32.	Practical session	2	2	-	Lesson 3: Passing railway crossings and route vehicle stops. Stopping at the pavement and starting movement. 1. Passing railway crossings, settlements, and route vehicle stops within their boundaries. Entering a road within settlements. Stopping at the pavement and starting movement.
33.	Practical session	2	2	-	Lesson 4. Movement in traffic within a settlement, manoeuvring, parking, driving on one-way roads (1 hour – driving on the site in the dark). 1. Movement in the traffic flow, manoeuvring, overtakes vehicles. 2. Passing pedestrian crossings and route vehicle stops, stopping at the pavement. 3. Parking the vehicle and leaving a parking space (parallel, diagonal, or perpendicular parking, forward or reverse, on a flat surface, uphill, or downhill).
34.	Practical session	2	2	-	Lesson 5. Driving on one-way roads. 1. Driving on one-way roads. 2. U-turns on a motorway, overpass, or in a tunnel.
35.	Practical session	2	2	-	Lesson 6. Passing intersections. 1. Passing complex regulated and unregulated intersections. 2. Passing intersections in traffic, turning right, left, and making U-turns at the intersection.
36.	Practical session	2	2	-	Lesson 7. Movement in the traffic flow within a settlement, manoeuvring, stopping and starting on hills, passing intersections and railway crossings 1. Starting from the pavement (roadside), accelerating to the highest gear and downshifting to the lowest, driving at different speeds, stopping, driving a vehicle on a motorway with low and high traffic intensity, overtaking, bypassing, and passing oncoming traffic, manoeuvring in confined spaces, stopping and starting on hills, passing intersections and railway crossings.
		8	8	-	Topic 5. Driving a vehicle in special conditions.
37.	Practical session	2	2	-	Lesson 1: Driving a vehicle off-road. 1. Driving a vehicle in off-road conditions. Driving on a dirt road.
38.	Practical session	2	2	-	Lesson 2. Driving on bypass roads, oncoming traffic. Driving on sharp turns, uphill, downhill, forest and other roads. 1. Driving on bypass roads, passing oncoming traffic. 2. Driving on sharp curves, uphill and downhill slopes, snowy, forest and other roads.
39.	Practical session	2	2	-	Lesson 3: Driving in the dark. Use of lighting devices. Driver's actions in case of blindness. 1. Driving a vehicle in the dark. Driving on a road with and without artificial lighting. Use of lighting devices. Actions of the driver of the vehicle in case of dazzle by oncoming headlights.
40.	Practical session	2	2	-	Lesson 4. Towing a vehicle. 1. Towing a vehicle. Coupling of vehicles with a rigid and flexible hitch in compliance with safety requirements. Checking the reliability of the hitch. 2. Towing the vehicle in a straight line, on bends, uphill and downhill gradients. Stopping near the pavement (on the

					roadside). Entering the gate, unhitching the vehicle. 3. Driving in a manner that ensures safety and reduces fuel consumption and emissions when increasing and decreasing speed on uphill and downhill gradients, if necessary by selecting gears.
		8	8	-	Topic 6. Improving driving skills.
41.	Practical session	2	2	-	Lesson 1: Manoeuvring in tight spaces, reversing. Urgent acceleration and braking. 1. Manoeuvring in tight spaces, reversing. 2. Difficult and emergency manoeuvring. Urgent acceleration and braking.
42.	Practical session	2	2	-	Lesson 2. Manoeuvring on a road with heavy traffic. Interaction with other road users. 1. Manoeuvring on a motorway with heavy traffic. Interaction with pedestrians and other road users. Manoeuvring, passing, overtaking, stopping, starting.
43.	Practical session	2	2	-	Lesson 3: Driving a car with a trailer. 1. Driving a vehicle with a trailer not exceeding 750 kilograms.
44.	Practical session	2	2	-	Lesson 4. Improving your driving skills. 1. Ability to follow road signs and markings. Predicting the development of the road situation, the actions of the vehicle driver to prevent it. 2. Techniques of driving a vehicle (slow moving from a place, urgent acceleration, selection of the optimal speed and transmission of forecasting the nature of traffic flow, use of inertia).
Total:		90	90	-	

MS 2. VEHICLES.

1. General objective of the educational programme component:

Upon completion of the educational programme component, the learner should:

know:

The structure of the chassis of automotive equipment;

The main technical characteristics and operating principles of the mechanisms of the chassis of automotive equipment;

The processes occurring in the components and assemblies of automotive equipment;

Methods for diagnosing malfunctions and faults that may arise during the operation of automotive equipment;

The procedure for performing technical actions to ensure the proper operation of automotive equipment.

be able to:

Apply acquired knowledge and understanding to analyse processes occurring in automotive equipment;

Identify malfunctions and faults in the operation of automotive equipment;

Organise repair actions to ensure the proper operation of automotive equipment.

2. Organisational and methodological guidelines:

2.1. Features of the teaching methodology:

The teaching methodology of the academic discipline is based on the fundamental principles of didactics (the theory of justification and learning). It provides a scientific-pedagogical description of the forms and methods of teaching, identifies the most appropriate combinations to achieve the desired level of learning, and determines the conditions for their most effective use.

To achieve the main learning objective, the programme provides for the following forms of instruction:

Frontal form of instruction, where all participants, under the supervision of the instructor, perform the same task simultaneously;

Group form of instruction, where participants are organised into groups (units) based on the standard structure of the unit, working in parallel;

Individual form of instruction, where participants perform tasks sequentially, one after another.

Depending on the need to achieve specific levels of knowledge or skills, the instructor should use the following methods:

Verbal-visual method;

Training method;

Situational-cognitive method.

The **verbal-visual method** involves the instructor systematically and sequentially presenting the instructional material, demonstrating the objects being studied to provide learners with new knowledge and form appropriate understanding.

The **training (reproductive) method** involves performing complex actions according to a pre-established algorithm set by the lesson leader to develop necessary skills and ensure the coherence of military-organisational structures.

The **situational-cognitive method** involves reviewing and discussing real (or likely) actions, familiarising learners with the experience of managing forces in military conflicts, and developing skills in information-analytical activities.

The above methods provide participants with knowledge, skills, and abilities, but to develop their creative abilities, the lesson leader should use problem-based learning methods.

Problem-based teaching involves the lesson leader presenting a problem to the learners, solving it themselves while demonstrating the solution process and revealing their thought process. The direct result of problem-based teaching should be the learner's assimilation of the method and logic of solving a specific problem, though not yet with the ability to apply it independently. This method teaches learners how to seek knowledge, helping them acquire skills in creative thinking.

The **search (heuristic) method** aims to gradually guide learners toward independently solving problems by first teaching them to perform individual elements of the solution. It is used during group exercises, where the lesson leader determines the approach to finding the optimal solution, but the learner finds the solution themselves.

Problem-based methods ensure deep assimilation of knowledge at the level of creative application, mastery of creative thinking methods, and practical experience.

During lecture sessions:

A lecture is the primary form of conducting instructional sessions aimed at mastering the theoretical material of the topic.

The main objective of the lecture is to present systematised fundamentals of scientific knowledge and practical experience on the topic, the state and prospects of management science development, and the theory and practice of managerial activities of a military leader, focusing attention on the most complex and critical issues of the instructional material. The lecture should be problem-oriented, stimulate active cognitive activity among learners, and promote the development of their creative thinking. To enhance the cognitive activity of military personnel and foster creative thinking during lectures, technical teaching aids should be skilfully combined with active forms and methods of lecture delivery. Sessions should be conducted through oral presentation of the instructional material, with certain questions and instructional elements addressed through dialogue between the instructor and learners and by posing problem-based questions.

During group sessions:

A group session is a type of instructional session during which the instructor presents new material using the verbal-visual method, monitors the assimilation of this material through questioning, and facilitates its consolidation.

Group sessions are conducted to enable learners to study in detail the issues and problems discussed in lectures and to thoroughly examine relevant aspects of the instructional material. The primary teaching methods include explanation with demonstration and discussion in the form of a dialogue. To ensure visual clarity during sessions, technical means of information transmission, tables, diagrams, slides, filmstrips, and posters should be used.

During practical sessions:

A practical session is a type of instructional session during which the instructor organises the assimilation of theoretical principles of the topic through the individual completion of specially designed tasks and facilitates the development of skills and abilities for their practical application.

Practical sessions should focus on consolidating and deepening the knowledge acquired by learners during lectures, group sessions, and independent work, as well as developing their skills in solving practical tasks related to daily military activities.

During group exercises:

A group exercise is a type of instructional session conducted by having learners perform the functional duties of designated officials of military management bodies, military units, or subunits.

During these sessions, cadets (participants) acquire skills in organising and planning combat (operations), managing forces, and ensuring their comprehensive support. Complex tactical tasks are developed for conducting group exercises.

During independent work:

Independent work is carried out to master and assimilate instructional material, consolidate and deepen knowledge, skills, and abilities, prepare for subsequent sessions and assessments, and foster a culture of intellectual work, independence, and initiative in seeking, acquiring, and enriching knowledge among learners.

Independent work should be supported with educational literature, study guides, tasks, and methodological recommendations. All instructional and methodological materials for sessions should have electronic versions. Methodological materials for independent work should provide opportunities for self-assessment.

2.2. Material and technical support:

Sessions should be conducted in specialised classrooms equipped with personal computing equipment at a ratio of one workstation per two participants and at the training ground of the educational process support centre. The use of technical teaching aids is mandatory during instructional sessions.

2.3. Information and methodological support:

1. Album of drawings ZIL-131. (Edited by A. Kachura) – M. Kolos, 1975, 208 p.;
2. ZIL-131 vehicle and its modifications. Technical Manual, (Edited by M. Sekirin) – M. VI, 1982, 296 p.;
3. KrAZ-6322-02, KrAZ-63221-02, KrAZ-6446-02 vehicles. Technical Manual, – K., 2008, 264 p.;
4. URAL diesel vehicles (Edited by A. Romanchenko) – M. Transport, 1984, 208 p.;
5. Design and maintenance of KAMAZ vehicles (Edited by E. Unger) – M. Transport, 1976, 391 p.;
6. GAZ-66-11 vehicle and its modifications. Technical Manual, (Edited by M. Sekirin) – M. VI, 1987, 215 p.;
7. UAZ-469 and UAZ-469B vehicles. Technical Manual, (Edited by M. Sekirin) – M. VI, 1989, 127 p.;
8. Automobiles. Design fundamentals, theory (Edited by V. Sirota) – O. VA, 2016, 355 p.;
9. Automobiles. Theory (Edited by V. Sakhno) – O. VA, 2017, 413 p.;
10. On the Strategic Defence Bulletin of Ukraine: Decree of the President of Ukraine dated 06.06.2016 No. 240/2016 // Database “Legislation of Ukraine”/Verkhovna Rada of Ukraine. URL: <https://zakon.rada.gov.ua/laws/show/n0006525-16#Text> (accessed: 28.07.2020);
11. White Book of the Anti-Terrorist Operation in Eastern Ukraine (2014–2016) / [Edited by I. Rusnak] – K.: National Defence University of Ukraine named after Ivan Chernyakhovsky, 2017, 162 p.

Titles of topics and distribution of study time by types of academic activities.

№	Types of academic activities, assessment methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
1	2	3	4	5	6
Semester 3					
Section 1. The structure of the vehicle.					
		9	6	3	Topic 1: General structure of vehicles and their classification
	Lecture	3	2	1	Lesson 1. Introduction to the discipline. 1. Role of the discipline, its structure, and sequence of study by semesters. 2. Role of automotive equipment in the Armed Forces of Ukraine and main directions of its development. 3. Classification of the rolling stock of automotive transport. 4. State of armaments and military equipment of the Armed Forces of Ukraine during the Joint Forces Operation (JFO).
	Group session	3	2	1	Lesson 2: Layout diagrams. 1. Wheel formula and type of drive. 2. Features of the design of trucks. 3. Design features of passenger automobiles. 4. Features of the design of buses.
	Group session	3	2	1	Lesson 3: Automobile engine. 1. Purpose and classification of automobile engines. 2. Main characteristics of petrol engines. 3. Main characteristics of diesel engines. 4. Features of operating automotive equipment based on the experience of the JFO.
		51	34	17	Topic 2. Transmission of trucks.
	Lecture	3	2	1	Lesson 1: Automobile clutches. 1. Purpose, types, and requirements for clutches. 2. Schematic diagrams of friction clutches. 3. Clutch control drive. 4. Clutch malfunctions and their impact on the technical condition of the vehicle based on the experience of the JFO.
	Group session	3	2	1	Lesson 2: Design features of clutches with cylindrical springs. 1. Structure of clutches with cylindrical springs.

№	Types of academic activities, assessment methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
1	2	3	4	5	6
					2. Operation of clutches with cylindrical springs.
	Group session	3	2	1	Lesson 3: Design features of clutches with diaphragm springs 1. Structure of clutches with diaphragm springs. 2. Operation of clutches with diaphragm springs.
	Group session	3	2	1	Lesson 4. Torque converter 1. Design features of the torque converter. 2. Operation of the torque converter.
	Group session	3	2	1	Lesson 5. Pneumohydraulic clutch booster 1. Design features of the pneumohydraulic booster. 2. Operation of the pneumohydraulic booster.
	Practical session	7	6	1	Lesson 6. Design features of clutches in vehicles of the Armed Forces of Ukraine 1. Design features of clutches in passenger cars. 2. Design features of clutches in trucks.
	Lecture	4	2	2	Lesson 7. Automobile gearboxes. 1. Purpose, types, and requirements for gearboxes. 2. Design and operation of gearboxes. 3. Gearbox control mechanisms.
	Group session	4	2	2	Lesson 8. Three-shaft gearboxes of automobiles. 1. Design features. 2. Operation of gearboxes.
	Group session	3	2	1	Lesson 9. Two-shaft gearboxes of automobiles. 1. Design features. 2. Operation of gearboxes.
	Group session	3	2	1	Lesson 10. Automatic gearboxes. 1. Design features. 2. Operation of gearboxes.
	Group session	3	2	1	Lesson 11. Operation of auxiliary gearboxes. 1. Design features.

№	Types of academic activities, assessment methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
1	2	3	4	5	6
					2. Operation of gearboxes.
	Practical session	8	6	2	Lesson 12. Design features of gearboxes in vehicles of the Armed Forces of Ukraine. 1. Design features of gearboxes in front-wheel-drive vehicles. 2. Design features of gearboxes in rear-wheel-drive vehicles.
	Lecture	4	2	2	Lesson 13. Transfer case of the automobile. 1. Purpose, classification, and requirements for the transfer case. 2. General structure of the transfer case. 3. Operation of the transfer case.
Total for the semester		60	40	20	
Semester 4					
Section 1. Structure of a car					
		42	28	14	Topic 2. Transmission of trucks
	Group session	4	2	2	Lesson 1. Transfer case with differential. 1. Design features. 2. Operation of the transfer case.
	Practical session	8	6	2	Lesson 2: Design features of transfer cases in vehicles of the Armed Forces of Ukraine. 1. Design features of transfer cases with locked drive. 2. Design features of transfer cases with differential drive. 3. Design features of transfer cases with mixed drive.
	Lecture	3	2	1	Lesson 3: Cardan transmission of automobiles 1. Purpose, classification, and requirements for cardan transmission. 2. General structure of cardan transmission. 3. Operation of cardan transmission.
	Group session	4	2	2	Lesson 4. Features of constant velocity joints (CV joints). 1. Purpose and types of constant velocity joints. 2. Operation features of constant velocity joints.
	Practical session	3	2	1	Lesson 5. Design features of cardan transmissions in vehicles of the Armed Forces of Ukraine.

№	Types of academic activities, assessment methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
1	2	3	4	5	6
					<ol style="list-style-type: none"> 1. Design features of cardan transmissions with non-constant velocity joints. 2. Design features of cardan transmissions with constant velocity joints.
	Lecture	3	2	1	Lesson 6. Drive axles of automobiles. <ol style="list-style-type: none"> 1. Purpose, classification, and requirements for drive axles. 2. Design features.
	Group session	4	2	2	Lesson 7. Main gear of automobiles. <ol style="list-style-type: none"> 1. Purpose, classification, and requirements for the main gear. 2. Design features of main gears. 3. Operation of the main gear.
	Group session	4	2	2	Lesson 8. Differential of automobiles. <ol style="list-style-type: none"> 1. Purpose, classification, and requirements for differentials. 2. Design features and operating principles.
	Group session	3	2	1	Lesson 9. Design features of limited-slip differentials and Torsen differentials. <ol style="list-style-type: none"> 1. Design features of limited-slip differentials. 2. Operation features of limited-slip differentials. 3. Design features of Torsen differentials. 4. Operation features of Torsen differentials.
	Practical session	6	6		Lesson 10. Design features of drive axles in vehicles of the Armed Forces of Ukraine. <ol style="list-style-type: none"> 1. Design features of main gears. 2. Design features of differentials. 3. Design features of half-axles. 4. Modular assessment.
		16	10	6	Topic 3: Chassis of trucks.
	Lecture	3	2	1	Lesson 1: Chassis of the automobile. <ol style="list-style-type: none"> 1. Purpose and components of the automobile chassis. 2. Purpose, types, and design of load-bearing systems. 3. Purpose, types, and requirements for suspension. 4. Suspension design.

№	Types of academic activities, assessment methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
1	2	3	4	5	6
	Group session	4	2	2	Lesson 2: Elastic elements of suspensions. 1. Purpose and classification of elastic elements. 2. Design features of elastic elements.
	Group session	4	2	2	Lesson 3: Damping devices. 1. Purpose and classification of damping devices. 2. Design features of damping devices.
	Group session	3	2	1	Lesson 4. Guiding and stabilising elements of suspensions. 1. Purpose and classification of guiding elements of suspensions. 2. Design features of guiding elements of suspensions. 3. Purpose and classification of stabilising elements of suspensions. 4. Design features of stabilising elements of suspensions.
	Practical session	2	2		Lesson 5. Design features of suspensions in vehicles of the Armed Forces of Ukraine. 1. Design features of elastic elements of suspensions. 2. Design features of damping devices. 3. Design features of guiding and stabilising elements of suspensions.
	Differentiated credit	2	2		
Total for the semester		60	40	20	
Semester 5					
Section 1. Structure of the automobile.					
		20	14	6	Topic 3: Chassis of trucks.
	Lecture	4	2	2	Lesson 1: Automobile axles. 1. Purpose, types, and requirements for automobile axles. 2. Design of automobile axles.
	Lecture	3	2	1	Lesson 2: Wheels and tyres of automobiles. 1. Purpose and types of wheels. 2. Purpose, types, and requirements for tyres. 3. Design of the wheel.
	Group session	3	2	1	Lesson 3: Design features of tyres.

№	Types of academic activities, assessment methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
1	2	3	4	5	6
					<ol style="list-style-type: none"> 1. Diagonal and radial tyres. 2. Inner tube and tubeless tyres.
	Practical session	8	6	2	Lesson 4. Design features of wheels and tyres of vehicles of the Armed Forces of Ukraine. <ol style="list-style-type: none"> 1. Design features of wheels of automobiles. 2. Design features of tyres of automobiles.
	Practical session	2	2		Lesson 5. Modular assessment <ol style="list-style-type: none"> 1. Design features of the automobile chassis.
		40	26	14	Topic 4. Control systems of trucks.
	Lecture	4	2	2	Lesson 1. Steering control of the automobile. <ol style="list-style-type: none"> 1. Purpose, types, and requirements for steering control. 2. Steering mechanism. 3. Steering drive. 4. Design of steering controls.
	Group session	4	2	2	Lesson 2. Steering mechanisms. <ol style="list-style-type: none"> 1. Worm gear mechanisms. 2. Screw mechanisms. 3. Rack-and-pinion mechanisms.
	Group session	4	2	2	Lesson 3. Steering drives. <ol style="list-style-type: none"> 1. Kinematics features of steering drives. 2. Design of steering drive joints.
	Practical session	8	6	2	Lesson 4. Design features of steering control in vehicles of the Armed Forces of Ukraine. <ol style="list-style-type: none"> 1. Design features of steering control in trucks of the Armed Forces of Ukraine. 2. Design features of steering control in passenger cars of the Armed Forces of Ukraine.
	Lecture	4	2	2	Lesson 5. Braking systems of automobiles. <ol style="list-style-type: none"> 1. Purpose, types, and requirements for braking systems. 2. Brake mechanisms. 3. Brake drives.
	Group session	4	2	2	Lesson 6. Braking mechanisms.

№	Types of academic activities, assessment methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
1	2	3	4	5	6
					1. Drum brake mechanisms. 2. Disc brake mechanisms.
	Group session	4	2	2	Lesson 7. Brake drives. 1. Schemes of dual-circuit brake drives. 2. Features of pneumatic and hydraulic drives.
	Group session	2	2		Lesson 8. Pneumo-hydraulic control equipment of braking systems. 1. Design and operation of the dual-circuit brake valve of the ZIL-131 automobile. 2. Design and operation of the pneumo-hydraulic booster of the URAL automobile. 3. Design and operation of the vacuum brake booster of the GAZ-66 automobile.
	Practical session	4	4		Lesson 9. Design features of braking systems in vehicles of the Armed Forces of Ukraine. 1. Braking system of passenger cars. 2. Braking system of trucks.
	Practical session	2	2		Lesson 10. Modular assessment. 1. Design features of automobile control systems.
	Total for the semester	60	40	20	
	Examination				
	Total for the discipline	180	120	60	

MS 3. AUTOMOTIVE ENGINES.

1. General objective of the educational programme component:

Upon completion of the educational programme component, the learner should

Know:

The structure of internal combustion engines;

Main malfunctions of internal combustion engines and procedures for their elimination;

Methods for analysing traction-speed characteristics of a vehicle and performing thermal process calculations of an engine using information technologies, and analysing traction-speed characteristics of a vehicle.

Be able to:

Monitor the technical condition, use, and ensure safe and accident-free operation of internal combustion engines;

Organise work to eliminate malfunctions of internal combustion engines;

Perform maintenance of internal combustion engines.

2. Organisational and methodological guidelines:

2.1. Features of the teaching methodology:

The teaching methodology of the academic discipline is based on the fundamental principles of didactics (the theory of justification and learning). It provides a scientific-pedagogical description of the forms and methods of teaching, identifies the most appropriate combinations to achieve the desired level of learning, and determines the conditions for their most effective use.

To achieve the main learning objective, the programme provides for the following forms of instruction:

Frontal form of instruction, where all participants, under the supervision of the instructor, perform the same task simultaneously;

Group form of instruction, where participants are organised into groups (units) based on the standard structure of the unit, working in parallel;

Individual form of instruction, where participants perform tasks sequentially, one after another.

Depending on the need to achieve specific levels of knowledge or skills, the instructor should use the following methods:

Verbal-visual method;

Training method;

Situational-cognitive method.

The **verbal-visual method** involves the instructor systematically and sequentially presenting the instructional material, demonstrating the objects being studied to provide learners with new knowledge and form appropriate understanding.

The **training (reproductive) method** involves performing complex actions according to a pre-established algorithm set by the lesson leader to develop necessary skills and ensure the coherence of military-organisational structures.

The **situational-cognitive method** involves reviewing and discussing real (or likely) actions, familiarising learners with the experience of managing forces in military conflicts, and developing skills in information-analytical activities.

The above methods provide participants with knowledge, skills, and abilities, but to develop their creative abilities, the lesson leader should use problem-based learning methods.

Problem-based teaching involves the lesson leader presenting a problem to the learners, solving it themselves while demonstrating the solution process and revealing their thought process. The direct result of problem-based teaching should be the learner's assimilation of the method and logic of solving a specific problem, though not yet with the ability to apply it independently. This method teaches learners how to seek knowledge, helping them acquire skills in creative thinking.

The **search (heuristic) method** aims to gradually guide learners toward independently solving problems by first teaching them to perform individual elements of the solution. It is used during group exercises, where the lesson leader determines the approach to finding the optimal solution, but the learner finds the solution themselves.

Problem-based methods ensure deep assimilation of knowledge at the level of creative application, mastery of creative thinking methods, and practical experience.

During lecture sessions:

A lecture is the primary form of conducting instructional sessions aimed at mastering the theoretical material of the topic.

The main objective of the lecture is to present systematised fundamentals of scientific knowledge and practical experience on the topic, the state and prospects of management science development, and the theory and practice of managerial activities of a military leader, focusing attention on the most complex and critical issues of the instructional material. The lecture should be problem-oriented, stimulate active cognitive activity among learners, and promote the development of their creative thinking. To enhance the cognitive activity of military personnel and foster creative thinking during lectures, technical teaching aids should be skilfully combined with active forms and methods of lecture delivery. Sessions should be conducted through oral presentation of the instructional material, with certain questions and instructional elements addressed through dialogue between the instructor and learners and by posing problem-based questions.

During group sessions:

A group session is a type of instructional session during which the instructor presents new material using the verbal-visual method, monitors the assimilation of this material through questioning, and facilitates its consolidation.

Group sessions are conducted to enable learners to study in detail the issues and problems discussed in lectures and to thoroughly examine relevant aspects of the instructional material. The primary teaching methods include explanation with demonstration and discussion in the form of a dialogue. To ensure visual clarity during sessions, technical means of information transmission, tables, diagrams, slides, filmstrips, and posters should be used.

During practical sessions:

A practical session is a type of instructional session during which the instructor organises the assimilation of theoretical principles of the topic through the individual completion of specially designed tasks and facilitates the development of skills and abilities for their practical application.

Practical sessions should focus on consolidating and deepening the knowledge acquired by learners during lectures, group sessions, and independent work, as well as developing their skills in solving practical tasks related to daily military activities.

During group exercises:

A group exercise is a type of instructional session conducted by having learners perform the functional duties of designated officials of military management bodies, military units, or subunits.

During these sessions, cadets (participants) acquire skills in organising and planning combat (operations), managing forces, and ensuring their comprehensive support. Complex tactical tasks are developed for conducting group exercises.

During independent work:

Independent work is carried out to master and assimilate instructional material, consolidate and deepen knowledge, skills, and abilities, prepare for subsequent sessions and assessments, and foster a culture of intellectual work, independence, and initiative in seeking, acquiring, and enriching knowledge among learners

Independent work should be supported with educational literature, study guides, tasks, and methodological recommendations. All instructional and methodological materials for sessions should have electronic versions. Methodological materials for independent work should provide opportunities for self-assessment.

2.2. Material and technical support:

Sessions should be conducted in specialised classrooms equipped with personal computing equipment at a ratio of one workstation per two participants and at the training ground of the educational process support centre. The use of technical teaching aids is mandatory during instructional sessions.

2.3. Information and methodological support:

1. P.M. Hashchuk, T.H. Myskiv, S.V. Nikichuk. Automotive engines. Thermal and dynamic calculation: study guide. – Lviv, 2006, 144 p.
2. I.Ya. Raikov et al. Automobile design. Volume 2. Engine. 2001, 568 p.
3. Compiled by P.M. Hashchuk, T.H. Myskiv. Thermal calculation of an automotive engine. Methodological guidelines for the course project in the discipline “Automotive engines”. – Lviv, 1996, 36 p.
4. M.M. Vozny. Internal combustion engine design. Lecture course. – Lviv: LISV, 2004.
5. I.Ya. Raikov et al. Automobile design. Volume 2. Engine. 2001, 568 p.
6. P.M. Hashchuk, T.H. Myskiv. Thermal calculation of an automotive engine. Methodological guidelines for the course project in the discipline “Automotive engines”. – Lviv, 1996, 36 p.
7. Internal combustion engines. Theory [Text]: Textbook / V.H. Diachenko; edited by A.P. Marchenko. – Kharkiv: NTU “KhPI”, 2008, 488 p.
8. Automotive engines. Internal combustion engines: course design: study guide / V.V. Klymenko, D.O. Kotov – Odesa: VA (Odesa), 2018, 78 p.
9. O.I. Sorokivskiy, V.V. Malashchenko. Calculation of the main elements of the lubrication and cooling systems of the engine. Methodological guidelines for practical work and individual tasks in the discipline “Automotive engines”. – Lviv: LvTsNTEI, 2006, 20 p.

Titles of topics and allocation of class time by type of class

№	Types of academic activities, assessment methods	Total Hours	Among them		Numbers of semesters, sections, topics and classes, names, study questions
			Classroom hours	Independent work	
1	2	3	4	5	6
Semester 3					
Section 1. Design of engines.					
		45	30	15	Topic 1: Structure of the engine.
	Lecture	2	2		Lesson 1: Structure of piston internal combustion engines. 1. Purpose, general structure, and performance parameters of internal combustion engines. 2. Classification of internal combustion engines. 3. Basic concepts, definitions, and parameters characterising engine design. 4. State of armaments and military equipment of the Armed Forces of Ukraine during the Anti-Terrorist Operation (ATO).
	Lecture	5	2	3	Lesson 2: Operating principles of internal combustion engines. 1. Operating principle of piston engines. 2. Operating sequence of a four-stroke engine. 3. Operating sequence of a two-stroke engine. 4. Comparative evaluation of four-stroke and two-stroke engines.
	Lecture	4	2	2	Lesson 4. General concepts of actual engine cycles. 1. Working cycles of internal combustion engines and methods of their implementation. 2. Concept of the indicator diagram. 3. Characteristics of intake, compression, power stroke, and exhaust processes. 4. Efficiency indicators of the working cycle of an internal combustion engine.
	Group session	4	2	2	Lesson 5. Crankshaft-connecting rod mechanism. 1. Purpose, general structure, and classification of the crankshaft-connecting rod mechanism. 2. Forces acting on the components of the crankshaft-connecting rod mechanism. 3. Components of the crankshaft-connecting rod mechanism.
	Practical training	4	4		Lesson 6. Structure and operation of the crankshaft-connecting rod mechanism. 1. Engine cylinder block and piston group. 2. Connecting rod group and crankshaft. 3. Malfunctions of the crankshaft-connecting rod mechanism.

	Group session	4	2	2	Lesson 7. Structure of the valve timing mechanism. 1. Purpose and general structure of valve timing mechanisms. 2. Operation of the valve timing mechanism. Valve timing phases.
	Practical session	4	4		Lesson 8. Operation of the valve timing mechanism. 1. Sequence and procedure of operation of the valve timing mechanism. 2. Sequence and procedure for adjusting clearances in the valve timing mechanism.
	Lecture	4	2	2	Lesson 9. Lubrication system. 1. Purpose, general structure, and classification of lubrication systems. 2. Operation of the lubrication system in four-stroke and two-stroke engines.
	Practical session	4	4		Lesson 10. Structure and operation of the main elements of the lubrication system. 1. Oil pumps and filters. 2. Oil radiators (heat exchangers). 3. Crankcase ventilation and its devices.
	Lecture	4	2	2	Lesson 11. Engine cooling system. 1. Purpose, general structure, and classification of engine cooling systems. 2. Components of liquid and air cooling systems.
	Group session	4	2	2	Lesson 12. Engine starting systems, preheater. 1. Engine starting systems. Electric torch device. 2. Preheater. Procedure for starting the preheater. 3. Procedure for starting the engine with compressed air.
	Modular control	2	2		Lesson 13. Modular assessment. 1. Classification, general structure, and operating principles of an internal combustion engine with spark ignition. 2. Mechanisms of the internal combustion engine. 3. Lubrication, cooling, and starting systems of the internal combustion engine.
Total for the 3rd semester		45	30	15	
Semester 4					
		35	22	13	Topic 1: Structure of the engine.
	Lecture	4	2	2	Lesson 1: Engine fuel systems. 1. Purpose, general structure, and classification of fuel systems. 2. Structure of intake devices for the working fluid. 3. Exhaust gas release.
	Group session	4	2	2	Lesson 2. Petrol engine fuel system. 1. Structure and operation of components of the petrol engine fuel system. 2. Purpose, structure, and operation of electronic fuel delivery control systems. 3. Operation of the petrol engine fuel system.
	Practical session	4	2	2	Lesson 3: Petrol engine fuel system. 1. Structure of the diaphragm-type fuel pump.

					2. Inspection of the operation of the diaphragm-type fuel pump.
	Practical session	4	2	2	Lesson 4. Petrol engine fuel system. 1. Checking and adjusting the fuel level in the carburettor. 2. Adjusting the fuel mixture of the petrol engine.
17.	Group session	2	2		Lesson 5. Diesel engine fuel system. 1. Types of diesel fuel systems. 2. Purpose, structure, and operation of the low-pressure line in diesel engine fuel systems. 3. Purpose, structure, and operation of high-pressure pumps. 4. Purpose, structure, and operation of injectors.
18.	Practical session	7	4	3	Lesson 6. Diesel engine fuel system. 1. Adjustment of engine speed and fuel injection timing. 2. Adjustment of fuel delivery and mixture formation control systems in diesel engines.
19.	Practical session	4	4		Lesson 7. Structure and operation of main components of engine fuel systems. 1. Structure and operation of components of the petrol engine fuel system. 2. Structure and operation of components of the diesel engine fuel system. 3. Malfunctions of the fuel system and their symptoms.
20.	Lecture	4	2	2	Lesson 8. Fuel system of gas and multi-fuel engines. 1. Gas cylinder installations. 2. Components of the fuel system for gas and multi-fuel engines. 3. Operation of fuel systems for gas and multi-fuel engines.
21.	Lecture	2	2		Lesson 9. Increasing power and fuel efficiency of automotive engines. 1. Engine tuning. 2. Gas-dynamic, turbocharging, and other supercharging methods. 3. Improving engine fuel efficiency. 4. Future directions for the development of automotive engines.
		40	28	12	Topic 2. Design features of military vehicle engines.
22.	Group session	7	2	3	Lesson 1: Design features of the crankshaft-connecting rod mechanism of YaMZ-238, KamAZ-740, V-46-S1, and UTD-20 engines. 1. Design and operation features of the crankshaft-connecting rod mechanism of the YaMZ-238 engine. 2. Design and operation features of the crankshaft-connecting rod mechanism of the V-46-S1 engine. 3. Design and operation features of the crankshaft-connecting rod mechanism of the UTD-20 engine.
23.	Group session	5	2	3	Lesson 2: Design features of the valve timing mechanism of YaMZ-238, V-46-S1, and UTD-20 engines. 1. Design and operation features of the valve timing mechanism of the YaMZ-238 engine. 2. Design and operation features of the valve timing mechanism of the V-46-S1 and UTD-20 engines.
24.	Group session	2	2		Lesson 3: Design and operation features of the lubrication systems of YaMZ-238, KamAZ-740, V-46-S1, and UTD-20 engines. 1. Design and operation features of the lubrication system of the YaMZ-238 engine. 2. Design and operation features of the lubrication system of the KamAZ-740 engine. 3. Design and operation features of the lubrication system of the V-46-S1 and UTD-20 engines.

25.	Group session	2	2		Lesson 4. Design and operation features of the cooling systems of YaMZ-238, KamAZ-740, V-46-S1, and UTD-20 engines. 1. Design and operation features of the cooling system of the YaMZ-238 engine. 2. Design and operation features of the cooling system of the KamAZ-740 engine. 3. Design and operation features of the cooling system of the V-46-S1 and UTD-20 engines.
26.	Group session	6	4	2	Lesson 5. Design and operation features of the fuel systems of carburettor and diesel engines in military vehicles. 1. Design and operation features of the fuel system of carburettor engines. 2. Design and operation features of the fuel system of diesel engines.
27.	Practical session	6	4	2	Lesson 6. Inspection and testing of truck engines. 1. Inspection and testing of the crankshaft-connecting rod and valve timing mechanisms of the ZIL-131 and ZMZ-66 engines. 2. Inspection and testing of the crankshaft-connecting rod and valve timing mechanisms of the YaMZ-238 and KamAZ-740 engines.
28.	Practical session	6	4	2	Lesson 7. Inspection and testing of truck engines. 1. Inspection and testing of the lubrication and cooling systems of the ZIL-131 and ZMZ-66 engines. 2. Inspection and testing of the lubrication and cooling systems of the YaMZ-238 and KamAZ-740 engines.
29.	Practical session	4	4		Lesson 8. Inspection and testing of truck engines. 1. Inspection and testing of the fuel system of carburettor engines ZIL-131 and ZMZ-66. 2. Inspection and testing of the fuel system of diesel engines YaMZ-238 and KamAZ-740.
	Modular control	2	2		Lesson 9. Modular assessment. 1. Classification, general structure, and operating principles of diesel internal combustion engines. 2. Design features of the mechanisms of a diesel internal combustion engine. 3. Fuel systems of an internal combustion engine with spark ignition. 4. Design features of the systems of a diesel internal combustion engine. 5. Design features of the mechanisms of a diesel internal combustion engine.
DC		2	2		Differentiated credit
Total for the 4th semester		75	50	25	
Total :		120	140	70	

MS 4. TECHNICAL OPERATION OF VEHICLES

1. General objective of the educational programme component:

Upon completion of the educational programme component, the learner should know:

The procedure for organising and conducting the operation and maintenance of automotive equipment to maintain constant combat readiness;
Features of using automotive equipment in various operating conditions.

be able to:

Monitor the technical condition, use, and ensure safe and accident-free operation of automotive equipment;
Perform repairs and maintenance of assemblies, systems, and components of automotive equipment for various purposes during operation.

2. Organisational and methodological guidelines:

2.1. Features of the teaching methodology:

The teaching methodology of the academic discipline is based on the fundamental principles of didactics (the theory of justification and learning). It provides a scientific-pedagogical description of the forms and methods of teaching, identifies the most appropriate combinations to achieve the desired level of learning, and determines the conditions for their most effective use.

To achieve the main learning objective, the programme provides for the following forms of instruction:

Frontal form of instruction, where all participants, under the supervision of the instructor, perform the same task simultaneously;

Group form of instruction, where participants are organised into groups (units) based on the standard structure of the unit, working in parallel;

Individual form of instruction, where participants perform tasks sequentially, one after another.

Depending on the need to achieve specific levels of knowledge or skills, the instructor should use the following methods:

Verbal-visual method;

Training method;

Situational-cognitive method.

The **verbal-visual method** involves the instructor systematically and sequentially presenting the instructional material, demonstrating the objects being studied to provide learners with new knowledge and form appropriate understanding.

The **training (reproductive) method** involves performing complex actions according to a pre-established algorithm set by the lesson leader to develop necessary skills and ensure the coherence of military-organisational structures.

The **situational-cognitive method** involves reviewing and discussing real (or likely) actions, familiarising learners with the experience of managing forces in military conflicts, and developing skills in information-analytical activities.

The above methods provide participants with knowledge, skills, and abilities, but to develop their creative abilities, the lesson leader should use problem-based learning methods.

Problem-based teaching involves the lesson leader presenting a problem to the learners, solving it themselves while demonstrating the solution process and revealing their thought process. The direct result of problem-based teaching should be the learner's assimilation of the method and logic of solving a specific problem, though not yet with the ability to apply it independently. This method teaches learners how to seek knowledge, helping them acquire skills in creative thinking.

The **search (heuristic) method** aims to gradually guide learners toward independently solving problems by first teaching them to perform individual elements of the solution. It is used during group exercises, where the lesson leader determines the approach to finding the optimal solution, but the learner finds the solution themselves.

Problem-based methods ensure deep assimilation of knowledge at the level of creative application, mastery of creative thinking methods, and practical experience.

During lecture sessions:

A lecture is the primary form of conducting instructional sessions aimed at mastering the theoretical material of the topic.

The main objective of the lecture is to present systematised fundamentals of scientific knowledge and practical experience on the topic, the state and prospects of management science development, and the theory and practice of managerial activities of a military leader, focusing attention on the most complex and critical issues of the instructional material. The lecture should be problem-oriented, stimulate active cognitive activity among learners, and promote the development of their creative thinking. To enhance the cognitive activity of military personnel and foster creative thinking during lectures, technical teaching aids should be skilfully combined with active forms and methods of lecture delivery. Sessions should be conducted through oral presentation of the instructional material, with certain questions and instructional elements addressed through dialogue between the instructor and learners and by posing problem-based questions.

During group sessions:

A group session is a type of instructional session during which the instructor presents new material using the verbal-visual method, monitors the assimilation of this material through questioning, and facilitates its consolidation.

Group sessions are conducted to enable learners to study in detail the issues and problems discussed in lectures and to thoroughly examine relevant aspects of the instructional material. The primary teaching methods include explanation with demonstration and discussion in the form of a dialogue. To ensure visual clarity during sessions, technical means of information transmission, tables, diagrams, slides, filmstrips, and posters should be used.

During practical sessions:

A practical session is a type of instructional session during which the instructor organises the assimilation of theoretical principles of the topic through the individual completion of specially designed tasks and facilitates the development of skills and abilities for their practical application. Practical sessions should focus on consolidating and deepening the knowledge acquired by learners during lectures, group sessions, and independent work, as well as developing their skills in solving practical tasks related to daily military activities.

During group exercises:

A group exercise is a type of instructional session conducted by having learners perform the functional duties of designated officials of military management bodies, military units, or subunits.

During these sessions, cadets (participants) acquire skills in organising and planning combat (operations), managing forces, and ensuring their comprehensive support. Complex tactical tasks are developed for conducting group exercises.

During independent work:

Independent work is carried out to master and assimilate instructional material, consolidate and deepen knowledge, skills, and abilities, prepare for subsequent sessions and assessments, and foster a culture of intellectual work, independence, and initiative in seeking, acquiring, and enriching knowledge among learners.

Independent work should be supported with educational literature, study guides, tasks, and methodological recommendations. All instructional and methodological materials for sessions should have electronic versions. Methodological materials for independent work should provide opportunities for self-assessment.

2.2. Material and technical support:

Sessions should be conducted in specialised classrooms equipped with personal computing equipment at a ratio of one workstation per two participants and at the training ground of the educational process support centre. The use of technical teaching aids is mandatory during instructional sessions.

2.3. Information and methodological support:

1. DSTU V 3576-97. Operation and repair. Terms and definitions. – Kyiv: Standards Publishing House, 1998.
2. DSTU 2860-94. Reliability of equipment. Terms and definitions. – Kyiv: Standards Publishing House, 1998.
3. Fundamentals of operating military automotive equipment: Study guide / V.A. Nikishyn, O.M. Kuprinenko, R.V. Berezenskyi, V.M. Melenchuk. – Odesa: Military Academy, 2014, 170 p.
4. Guidelines for unified workshops for maintenance and current repair of automobiles and tracked vehicles (MTO-AT, MTO-4 OS, MTO-ATG).
5. Methodological recommendations for establishing and determining service life norms for repair and decommissioning of automotive equipment and property.
6. Order of the Minister of Defence of Ukraine No. 115 dated 11.05.95. On equipping automotive equipment with spare parts and accessories and providing military units with parking equipment.
7. Order of the Minister of Defence of Ukraine No. 678 dated 12.12.16. On approval of the Instruction on the use of automotive equipment in the Ministry of Defence of Ukraine and the Armed Forces of Ukraine.
8. Order of the Minister of Defence of Ukraine No. 548 dated 17.08.12. On approval of amendments to the Regulation on road safety authorities of the Ministry of Defence of Ukraine. Resolution of the Cabinet of Ministers of Ukraine dated 30.11.11 No. 1225 “On approval of the Procedure for conducting mandatory technical inspection of vehicles of the Armed Forces of Ukraine”.
9. KrAZ-6322-02, KrAZ-63221-02, KrAZ-6446-02 automobiles. Operating manual 6322-016-02-3902010 U RE, AutoKrAZ Holding Company, Kremenchuk, 2008.
10. Annex No. 2 to the Order of the Minister of Defence of Ukraine dated 06.01.1999 No. 1. “Fuel, oil, lubricant, and special fluid consumption norms during operation, repair, and preservation of military equipment and armaments of the Armed Forces of Ukraine”.
11. Order of the Minister of Defence of Ukraine No. 219 dated 01.07.02. On approval of the Guidelines for the operation of automotive equipment in the Armed Forces of Ukraine in peacetime.
12. Order of the Minister of Defence of Ukraine No. 581 dated 05.03.2004. “On approval of the Instruction on the inspection and condition of armaments and military equipment in the Armed Forces of Ukraine”.
13. Order of the Minister of Defence of Ukraine No. 714 dated 05.12.2006. “On approval of amendments to the Guidelines for the operation of automotive equipment in the Armed Forces of Ukraine”.
14. Order of the Minister of Defence of Ukraine No. 184 dated 10.04.06. On approval of the Rules for the use of registration plates, application of identification marks, colour schemes, inscriptions, and special signals on vehicles of the Armed Forces of Ukraine.

15. Order of the Minister of Defence of Ukraine No. 366 dated 22.06.07. On approval of the Regulation on the provision of automotive equipment and property to the Armed Forces of Ukraine in peacetime.
16. O.F. Doroshenko, Operation of military automotive equipment. Part 1. Study guide. – Lviv: LISV, 2006.
17. O.F. Doroshenko, Operation of military automotive equipment. Part 2. Study guide. – Lviv: LISV, 2006.
18. O.F. Doroshenko, Operation of military automotive equipment. Part 3. Study guide. – Lviv: LISV, 2007.
19. O.F. Doroshenko, Operation of military automotive equipment. Part 4. Study guide. – Lviv: LISV, 2007.
20. Ye.Yu. Fornalchyk, M.S. Oliskevych, O.L. Mastyka, R.A. Pelio. Technical operation and reliability of automobiles. Study guide. – Lviv: Afisha, 2004.
21. Guidelines for logistical support of troops (forces). Draft. – Kyiv: General Staff of the Armed Forces of Ukraine, 2008.
22. Maintenance and servicing of batteries, equipment of battery military units. Recommendations. – Kyiv: Varta, 1996.
23. Storage of automotive equipment and property in the Armed Forces of Ukraine, guidelines, approved by the Order of the Deputy Minister of Defence of Ukraine for Armaments — Chief of Armaments of the Armed Forces of Ukraine dated 22.07.98 No. 72, Kyiv, Varta, 1999.
24. P.M. Belov et al. Engines of military vehicles. Part 1, 1972, 565 p., P.M. Belov et al. Engines of military vehicles. Theory, Part 1, 1972, 510 p.
25. Collection of technical training programmes for drivers (driver-mechanics) in the Armed Forces of Ukraine. Kyiv: Varta Military Publishing House, 1996.
26. Methodological recommendations for the preparation and use of units and subunits during the ATO No. 1390/DSK.
27. Priority measures for improving technical support in ATO conditions No. 1406/1 DSK.
28. Guidelines for the automotive service of the Armed Forces of Ukraine.
29. Methodological recommendations for the placement and securing of armaments and military equipment on railway rolling stock for transportation in echelons and transports, approved by the Commander of the Land Forces of the Armed Forces of Ukraine.
30. Order of the Minister of Defence of Ukraine dated 05.09.2013 No. 595. On approval of the Regulation on military transportation by railway, sea, river, and air transport.
31. B.A. Electrical equipment of military automotive equipment. 1988, 332 p.
32. V.A. Sazhko. Electrical equipment of automobiles and tractors. Textbook. Karavela, 2008, 400 p.
33. V.E. Yutt. Electrical equipment of automobiles. Textbook for automotive institutes. Transport, 1989, 287 p.
34. A 22 Military automobiles. Operation of military automotive equipment: Study guide / O.F. Doroshenko, P.P. Tkachenko, P.O. Rusilo, et al. – Lviv: Land Forces Academy Publishing House, 2010, 578 p.
35. Automotive enterprise for the maintenance of automotive equipment. Study guide / I. Kondratiuk, O. Lysyi, V. Nikishyn, S. Horbachevskyi – Odesa, 2017 (VA), 142 p.

Titles of topics and distribution of study time by types of academic activities.

№	Types of Academic Activities, Assessment Methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
1	2	3	4	5	6
Semester 5					
<u>Unit 1. General provisions on the technical operation of automobiles.</u>					
1.		12	6	6	<u>Topic 1 Fundamentals of operating automotive equipment.</u>
2.	Lecture	4	2	2	<p><u>Lesson 1. General provisions on the operation of automotive equipment.</u> (class number, class title)</p> <ol style="list-style-type: none"> 1. Life cycle of automotive equipment products. Operation as a stage of the life cycle. Results of operating military automotive equipment during preparation and use of forces in combat operations (Joint Forces Operation, JFO). 2. Composition and classification of automotive equipment. Vehicle operational documentation. Vehicle passport. 3. Operational groups of automotive equipment.
3.	Group session	4	2	2	<p><u>Lesson 2. Procedure for commissioning automotive equipment.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Preparation of military automotive equipment for use. Procedure for acceptance, commissioning, and assignment of a vehicle to a driver. 2. Registration, identification, and warning signs, inscriptions, and markings. 3. Organisation of claims work for the automotive service of a military unit.
4.	Group session	4	2	2	<p><u>Lesson 3. Use of motor vehicles</u> (class number, class title)</p> <ol style="list-style-type: none"> 1. General provisions on the use of military automotive equipment for its intended purpose in peacetime and wartime. 2. Features of using automotive equipment. 3. Resource and technical readiness coefficient of vehicles.
		14	10	4	<u>Topic 2 Transportation of automotive equipment.</u>
5.	Lecture	4	2	2	<p><u>Lesson 4 Preparation for transportation of automotive equipment.</u> (class number, class title)</p> <ol style="list-style-type: none"> 1. Preparation for transportation of automotive equipment by rail. 2. Preparation for transportation of automotive equipment by water. 3. Preparation for transportation of automotive equipment by air. 4. Preparation for transportation of automotive equipment by road trains.
6.	Group session	4	2	2	<p><u>Lesson 5 Placement and securing of automotive equipment during transportation.</u> (class number, class name)</p>

№	Types of Academic Activities, Assessment Methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
					<ol style="list-style-type: none"> 1. Placement and securing of automotive equipment during rail transportation. 2. Placement and securing of automotive equipment during water transportation. 3. Placement and securing of automotive equipment during air transportation. 4. Placement and securing of automotive equipment during transportation by road trains.
7.	Practical session	6	6	-	<p><u>Lesson 6 Practical execution of preparing automotive equipment for transportation.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Organisation of transportation of automotive equipment. 2. Loading of automotive equipment. 3. Securing of automotive equipment.
<u>Section 2. Maintenance of automotive equipment.</u>					
		22	16	6	<u>Topic 3 Types and means of maintenance of automotive equipment.</u>
8.	Lecture	4	2	2	<p><u>Lesson 1 Types of maintenance of automotive equipment.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Daily maintenance. 2. Maintenance PMSC-1 and PMSC-2 (Preventive Maintenance Checks and Services). 3. Seasonal maintenance. 4. Regulated maintenance. 5. Annual maintenance.
9.	Group session	6	4	2	<p><u>Lesson 3 Mobile maintenance facilities</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Classification and composition of mobile maintenance facilities. Use of mobile maintenance facilities in local conflicts (JFO). 2. Purpose and production capabilities of the automotive equipment maintenance workshop (MTO-AT). General equipment of MTO-AT and rules for its use. 3. Specialised MTO-AT kits.
10.	Group session	6	4	2	<p><u>Lesson 3 Operation of the maintenance workshop.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Deployment of the MTO-AT workshop and preparation of equipment for operation. 2. List of main tasks performed using the workshop equipment. 3. Disassembly of the workshop.

№	Types of Academic Activities, Assessment Methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
11.	Practical session	6	6	-	<p><u>Lesson 4 Deployment of the MTO-AT-M1 automotive equipment maintenance workshop.</u> (lesson number, lesson title)</p> <ol style="list-style-type: none"> 1. Deployment of the MTO-AT workshop and preparation of equipment for operation. 2. Performance of maintenance tasks. 3. Disassembly of the workshop.
		36	28	8	<u>Topic 4 Maintenance of the vehicle chassis</u>
12.	Group session	4	2	2	<p><u>Lesson 1 Transmission maintenance.</u> (lesson number, lesson title)</p> <ol style="list-style-type: none"> 1. Scope of transmission maintenance. 2. Inspection and checks of the transmission. Transmission maintenance procedures.
13.	Group session	4	2	2	<p><u>Lesson 2 Chassis maintenance.</u> (lesson number, lesson title)</p> <ol style="list-style-type: none"> 1. Scope of chassis maintenance. 2. Inspection and checks of the chassis. Chassis maintenance procedures.
14.	Practical session	4	4	-	<p><u>Lesson 3 Performing maintenance of the transmission and chassis.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Transmission maintenance. 2. Chassis maintenance.
15.	Group session	8	4	4	<p><u>Lesson 4 Maintenance of control systems.</u> (class number, class title)</p> <ol style="list-style-type: none"> 1. Scope of control systems maintenance. 2. Inspection and checks of control systems. Control systems maintenance procedures.
16.	Practical session	4	4	-	<p><u>Lesson 5 Performing maintenance of control systems.</u> (lesson number, lesson title)</p> <ol style="list-style-type: none"> 1. Steering system maintenance. 2. Brake system maintenance.
17.	Practical session	6	6	-	<p><u>Lesson 6: Maintenance of the vehicle chassis.</u> (class number, name of the class)</p> <ol style="list-style-type: none"> 1. Preparation for maintenance. 2. Transmission maintenance. 3. Chassis maintenance.

№	Types of Academic Activities, Assessment Methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
18.	Practical session	6	6	-	<p><u>Lesson 7 Maintenance of vehicle chassis</u> (lesson number, lesson title)</p> <ol style="list-style-type: none"> 1. Steering system maintenance. 2. Brake system maintenance. 3. Quality check of maintenance.
		18	6	12	<u>Topic 5 Maintenance of engine systems and mechanisms</u>
19.	Group session	6	2	4	<p><u>Lesson 1 Maintenance of the crankshaft-connecting rod and valve timing mechanisms.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Scope of engine mechanisms maintenance. 2. Inspection and checks of engine mechanisms. Maintenance procedures for engine mechanisms.
20.	Group session	6	2	4	<p><u>Lesson 2 Maintenance of the cooling system.</u> (class number, class title)</p> <ol style="list-style-type: none"> 1. Scope of cooling system maintenance. 2. Inspection and checks of the cooling system. Cooling system maintenance procedures.
21.	Group session	6	2	4	<p><u>Lesson 3 Maintenance of the lubrication system.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Scope of lubrication system maintenance. 2. Inspection and checks of the lubrication system. Lubrication system maintenance procedures.
22.		2	2		Differentiated credit
Total for the semester		100	64	36	
Semester 6					
		32	26	6	<u>Topic 5 Maintenance of engine systems and mechanisms</u>
23.	Practical session	6	6	-	<p><u>Lesson 1 Performing maintenance of engine systems and mechanisms.</u> (class number, title of the class)</p> <ol style="list-style-type: none"> 1. Maintenance of the crankshaft-connecting rod and valve timing mechanisms. 2. Maintenance of the cooling system. 3. Maintenance of the lubrication system.
24.	Group session	6	4	2	<p><u>Lesson 2 Maintenance of the fuel system of carburettor engines.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Scope of maintenance of the fuel system of carburettor engines.

№	Types of Academic Activities, Assessment Methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
					2. Inspection and checks of the fuel system of carburettor engines. Maintenance procedures for the fuel system of carburettor engines.
25.	Group session	6	4	2	<u>Lesson 3 Maintenance of the fuel system of diesel engines.</u> (class number, class title) 1. Scope of maintenance of the fuel system of diesel engines. 2. Inspection and checks of the fuel system of diesel engines. Maintenance procedures for the fuel system of diesel engines.
26.	Practical session	6	4	2	<u>Lesson 4 Performing maintenance of the fuel system.</u> (lesson number, title of the lesson) 1. Maintenance of the power supply system of carburettor engines. 2. Maintenance of the power supply system of diesel engines.
27.	Practical session	8	8	-	<u>Lesson 5 Performing engine maintenance.</u> (class number, class name) 1. Maintenance of carburettor engines. 2. Maintenance of diesel engines. 3. Modular assessment for Topics 1–5.
<u>Section 3 Storage of automotive equipment.</u>					
		10	6	4	<u>Topic 6 Theoretical foundations of storing automotive equipment.</u>
28.	Lecture	2	2	-	<u>Lesson 1. Conditions for storing automotive equipment.</u> (class number, class name) 1. Factors affecting the reliability of vehicles during storage. 2. Metal corrosion during storage. 3. Changes in rubber properties during storage.
29.	Group session	4	2	2	<u>Lesson 2 Methods of protecting automotive equipment during storage.</u> (class number, class name) 1. Methods of applying permanent protective coatings. 2. Methods of applying temporary protective coatings. 3. Electrochemical protection method.

№	Types of Academic Activities, Assessment Methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
30.	Group session	2	2	-	<p><u>Lesson 3 Preservation materials.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Materials used in preparing equipment for storage. 2. Groups of preservation materials. 3. Deployment of mobile preservation post equipment and preparation for operation.
		20	12	8	<u>Topic 7 Technology of storing automotive equipment.</u>
31.	Lecture	4	2	2	<p><u>Lesson 1: General provisions on the storage of automotive equipment and property.</u> (class number, class title)</p> <ol style="list-style-type: none"> 1. Organisation of activities for placing vehicles in storage. 2. Storage of automotive property. 3. Documentation developed and maintained during the organisation of automotive equipment storage.
32.	Group session	4	2	2	<p><u>Lesson 2 Preparation and maintenance of vehicles in storage.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Preparation and care of vehicles during short-term storage. 2. Preparation and care of vehicles during long-term storage. 3. Monitoring the condition of stored vehicles.
33.	Group session	4	2	2	<p><u>Lesson 3: Preparation of vehicles for use after storage.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Organisation of removing vehicles from storage. 2. Measures to expedite the preparation of vehicles for use. 3. Re-preservation of vehicles.
34.	Practical session	6	6	-	<p><u>Lesson 4 Practical execution of placing automotive equipment in storage.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Preparation for storage. 2. Placing automotive equipment in storage. 3. Modular assessment for Topics 6–7.
					<u>Unit 2 Maintenance of automotive equipment.</u>
		39	22	17	<u>Topic 8 Technology of maintenance of automotive equipment.</u>
35.	Lecture	8	2	6	<p><u>Lesson 1 Technology of maintenance of automotive equipment.</u> (class number, class title)</p>

№	Types of Academic Activities, Assessment Methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
					<ol style="list-style-type: none"> 1. Concept of the technological process. 2. Technological equipment for the maintenance of automotive equipment.
36.	Practical session	8	4	4	<p><u>Lesson 2 Practical execution of control inspection and daily maintenance of automotive equipment.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Preparation for conducting control inspection and daily maintenance. 2. Conducting control inspection and daily maintenance.
37.	Practical session	10	6	4	<p><u>Lesson 3 Practical execution of technical inspection PMCS-1 (Preventive Maintenance Checks and Services).</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Preparation for conducting technical inspection 1 (PMCS-1). 2. Conducting technical inspection 1 (PMCS-1).
38.	Practical session	8	6	2	<p><u>Lesson 4 Practical execution of technical inspection 2 (TO-2).</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Preparation for conducting technical inspection 2 (PMCS -2). 2. Conducting technical inspection 2 (PMCS -2). 3. Modular assessment for Topics 4, 5, and 8.
Total for the semester		96	62	34	
Semester 7					
		24	24	-	<u>Topic 8 Technology of maintenance of automotive equipment.</u>
39.	Practical training field	6	6	-	<p><u>Lesson 1 Practical execution of maintenance of automotive engines.</u> (class number, title of the class)</p> <ol style="list-style-type: none"> 1. Performing operations of technical inspection 1 (PMCS -1). 2. Performing operations of technical inspection 2 (PMCS -2).
40.	Practical session	6	6	-	<p><u>Lesson 2 Practical execution of maintenance of automotive engines.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Performing operations of technical inspection 1 (PMCS -1). 2. Performing operations of technical inspection 2 (PMCS -2).
41.	Practical session	6	6	-	<p><u>Lesson 3 Practical execution of maintenance of automotive engines.</u> (class number, class name)</p> <ol style="list-style-type: none"> 1. Performing operations of technical inspection 1 (PMCS -1). 2. Performing operations of technical inspection 2 (PMCS -2).

№	Types of Academic Activities, Assessment Methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
<u>Section 4. Theoretical foundations of technical operation of automobiles.</u>					
		16	12	4	<u>Topic 9 Features of operating automotive equipment in special conditions.</u>
42.	Lecture	2	2	-	<u>Lesson 1 Operation of vehicles at low air temperatures.</u> (class number, title of the class) 1. Impact of low temperatures on engine starting and operation, functionality of transmission components, control systems, and chassis. 2. Means and methods to ensure vehicle readiness and functionality at low air temperatures. 3. Preparation of vehicles for operation at low temperatures.
43.	Group session	6	2	4	<u>Lesson 2. Operation of automotive equipment in hot, desert-sandy, and mountainous regions.</u> (class number, class name) 1. Road and climatic conditions of the terrain (mountainous conditions, sandy regions). 2. Impact of mountainous conditions and increased air dustiness on vehicle functionality. 3. Measures to enhance the efficiency of vehicle use.
44.	Group session	2	2	-	<u>Lesson 3 Operation of automotive equipment in night conditions</u> 1. Impact of night conditions on vehicle use. 2. Measures to enhance the efficiency of vehicle use in night conditions.
45.	Practical training field	6	6	-	<u>Lesson 6 Operation of automotive equipment in special conditions.</u> (class number, class name) 1. Preparation of automotive equipment for use at low temperatures. 2. Preparation of automotive equipment for use in hot, desert-sandy, and mountainous regions. 3. Preparation of automotive equipment for use in night conditions.
Total for the semester		40	36	4	
Semester 8					
		4	4	-	<u>Topic 9 Features of operating automotive equipment in special conditions.</u>
46.	Practical session	4	4	-	<u>Lesson 1 Practical calculation of reliability indicators for automotive equipment.</u> (class number, class name) 1. Calculation of reliability indicators for non-repairable objects. 2. Calculation of reliability indicators for repairable objects. 3. Calculation of reliability indicators for complex systems.

№	Types of Academic Activities, Assessment Methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
<u>Section 2 Maintenance of automotive equipment.</u>					
		34	30	4	<u>Topic 8 Technology of maintenance of automotive equipment.</u>
47.	Group session	2	2	-	<u>Lesson 1 Maintenance of vehicle electrical power sources.</u> (class number, class name) 1. Scope of maintenance of vehicle electrical power sources. 2. Inspection and checks of vehicle electrical power sources. Maintenance procedures for vehicle electrical power sources.
48.	Group session	6	2	4	<u>Lesson 2 Maintenance of the electrical equipment system.</u> (class number, class name) 1. Scope of maintenance of the electrical equipment system. 2. Inspection and checks of the electrical equipment system. Maintenance procedures for the electrical equipment system.
49.	Practical session	6	6	-	<u>Lesson 3 Practical execution of maintenance of the electrical equipment system.</u> (class number, class title) 1. Maintenance of vehicle electrical power sources. 2. Maintenance of the engine electrical starting system. 3. Maintenance of the ignition system. 4. Modular assessment for Topics 4, 5, and 8.
50.	Practical session	6	6	-	<u>Lesson 4 Practical execution of maintenance of the electrical equipment system.</u> (class number, class name) 1. Maintenance of vehicle electrical power sources. 2. Maintenance of the engine electrical starting system. 3. Maintenance of the ignition system. 4. Maintenance of control and measuring instruments, lighting, and signalling devices.
51.	Practical session	6	6	-	<u>Lesson 5. Practical execution of maintenance of vehicles.</u> (class number, class name) 1. Performing operations of technical inspection 1 (PMCS -1). 2. Performing operations of technical inspection 2 (PMCS -2).
52.	Practical session	6	6	-	<u>Lesson 6. Practical execution of maintenance of vehicles.</u> (class number, class name) 1. Performing operations of technical inspection 1 (PMCS -1). 2. Performing operations of technical inspection 2 (PMCS -2).

№	Types of Academic Activities, Assessment Methods	Total hours	Among them		Types of academic activities, assessment methods
			Classroom hours	Independent work	
53.		4	4		<u>Examination</u>
Total for the semester		40	36	4	
Total for the semester		295			

MS 5. ELECTRONIC AND ELECTRICAL EQUIPMENT OF AUTOMOBILES.

1. General objective of the educational programme component:

Upon completion of the educational programme component, the learner should

know:

the structure and operating principles of electronic and microprocessor equipment, as well as electrical and electronic systems (devices) of military vehicles.

the procedure for operation and maintenance of electrical and electronic systems (devices) of military vehicles.

the main malfunctions that occur during the operation of electrical and electronic systems (devices) of military vehicles and the procedures for their elimination.

be able to:

analyse and evaluate processes occurring in the circuits of electrical and electronic devices of military vehicles.

use various instruments for diagnosing the operation of electrical and electronic systems (devices) of military vehicles.

organise proper operation and timely maintenance of electronic and microprocessor equipment, as well as electrical and electronic systems (devices) of military vehicles.

organise timely elimination of malfunctions in the operation of electrical and electronic equipment of military vehicles.

2. Organisational and methodological guidelines:

Features of the teaching methodology:

The teaching methodology of the academic discipline is based on the fundamental principles of didactics (the theory of justification and learning). It provides a scientific-pedagogical description of the forms and methods of teaching, identifies the most appropriate combinations to achieve the desired level of learning, and determines the conditions for their most effective use.

To achieve the main learning objective, the programme provides for the following forms of instruction:

Frontal form of instruction, where all participants, under the supervision of the instructor, perform the same task simultaneously.

Group form of instruction, where participants are organised into groups (units) based on the standard structure of the unit, working in parallel.

Individual form of instruction, where participants perform tasks sequentially, one after another.

Depending on the need to achieve specific levels of knowledge or skills, the instructor should use the following methods:

Verbal-visual method;

Training method;

Situational-cognitive method.

The **verbal-visual method** involves the instructor systematically and sequentially presenting the instructional material, demonstrating the objects being studied to provide learners with new knowledge and form appropriate understanding.

The **training (reproductive) method** involves performing complex actions according to a pre-established algorithm set by the lesson leader to develop necessary skills and ensure the coherence of military-organisational structures.

The **situational-cognitive method** involves reviewing and discussing real (or likely) actions, familiarising learners with the experience of managing forces in military conflicts, and developing skills in information-analytical activities.

The above methods provide participants with knowledge, skills, and abilities, but to develop their creative abilities, the lesson leader should use problem-based learning methods.

Problem-based teaching involves the lesson leader presenting a problem to the learners, solving it themselves while demonstrating the solution process and revealing their thought process. The direct result of problem-based teaching should be the learner's assimilation of the method and logic of solving a specific problem, though not yet with the ability to apply it independently. This method teaches learners how to seek knowledge, helping them acquire skills in creative thinking.

The **search (heuristic) method** aims to gradually guide learners toward independently solving problems by first teaching them to perform individual elements of the solution. It is used during group exercises, where the lesson leader determines the approach to finding the optimal solution, but the learner finds the solution themselves.

Problem-based methods ensure deep assimilation of knowledge at the level of creative application, mastery of creative thinking methods, and practical experience.

During lecture sessions:

A lecture is the primary form of conducting instructional sessions aimed at mastering the theoretical material of the topic.

The main objective of the lecture is to present systematised fundamentals of scientific knowledge and practical experience on the topic, the state and prospects of management science development, and the theory and practice of managerial activities of a military leader, focusing attention on the most complex and critical issues of the instructional material. The lecture should be problem-oriented, stimulate active cognitive activity among learners, and promote the development of their creative thinking. To enhance the cognitive activity of military personnel and foster creative thinking during lectures, technical teaching aids should be skilfully combined with active forms and methods of lecture delivery. Sessions should be conducted through oral presentation of the instructional material, with certain questions and instructional elements addressed through dialogue between the instructor and learners and by posing problem-based questions.

During group sessions:

A group session is a type of instructional session during which the instructor presents new material using the verbal-visual method, monitors the assimilation of this material through questioning, and facilitates its consolidation.

Group sessions are conducted to enable learners to study in detail the issues and problems discussed in lectures and to thoroughly examine relevant aspects of the instructional material. The primary teaching methods include explanation with demonstration and discussion in the form of a dialogue. To ensure visual clarity during sessions, technical means of information transmission, tables, diagrams, slides, filmstrips, and posters should be used.

During practical sessions:

A practical session is a type of instructional session during which the instructor organises the assimilation of theoretical principles of the topic through the individual completion of specially designed tasks and facilitates the development of skills and abilities for their practical application.

Practical sessions should focus on consolidating and deepening the knowledge acquired by learners during lectures, group sessions, and independent work, as well as developing their skills in solving practical tasks related to daily military activities.

During group exercises:

A group exercise is a type of instructional session conducted by having learners perform the functional duties of designated officials of military management bodies, military units, or subunits.

During these sessions, cadets (participants) acquire skills in organising and planning combat (operations), managing forces, and ensuring their comprehensive support. Complex tactical tasks are developed for conducting group exercises.

During independent work:

Independent work is carried out to master and assimilate instructional material, consolidate and deepen knowledge, skills, and abilities, prepare for subsequent sessions and assessments, and foster a culture of intellectual work, independence, and initiative in seeking, acquiring, and enriching knowledge among learners.

Independent work should be supported with educational literature, study guides, tasks, and methodological recommendations. All instructional and methodological materials for sessions should have electronic versions. Methodological materials for independent work should provide opportunities for self-assessment.

2.2. Material and technical support:

Sessions should be conducted in specialised classrooms equipped with personal computing equipment at a ratio of one workstation per two participants and at the training ground of the educational process support centre. The use of technical teaching aids is mandatory during instructional sessions.

2.3. Information and methodological support:

1. P.M. Hashchuk, T.H. Myskiv, S.V. Nikichuk. Automotive engines. Thermal and dynamic calculation: study guide. – Lviv, 2006, 144 p.
2. I.Ya. Raikov et al. Automobile design. Volume 2. Engine. 2001, 568 p.
3. Compiled by P.M. Hashchuk, T.H. Myskiv. Thermal calculation of an automotive engine. Methodological guidelines for the course project in the discipline “Automotive engines”. – Lviv, 1996, 36 p.
4. M.M. Vozny. Internal combustion engine design. Lecture course. – Lviv: LISV, 2004.
5. I.Ya. Raikov et al. Automobile design. Volume 2. Engine. 2001, 568 p.
6. P.M. Hashchuk, T.H. Myskiv. Thermal calculation of an automotive engine. Methodological guidelines for the course project in the discipline “Automotive engines”. – Lviv, 1996, 36 p.
7. Internal combustion engines. Theory [Text]: Textbook / V.H. Diachenko; edited by A.P. Marchenko. – Kharkiv: NTU “KhPI”, 2008, 488 p.
8. Automotive engines. Internal combustion engines: course design: study guide / V.V. Klymenko, D.O. Kotov – Odesa: VA (Odesa), 2018, 78 p.
9. O.I. Sorokivskiy, V.V. Malashchenko. Calculation of the main elements of the lubrication and cooling systems of the engine. Methodological guidelines for practical work and individual tasks in the discipline “Automotive engines”. – Lviv: LvTsNTEI, 2006, 20 p.

Titles of topics and distribution of study time by types of academic activities.

№	Types of Academic Activities, Assessment Methods	Total hours	Among them.		Types of academic activities, assessment methods
			Classroom hours	Independent work	
1	2	3	4	5	6
Semester 5					
Section 1. Electrical power sources of automobiles.					
		36	24	12	Topic №1. Electrical power supply system.
1.	Lecture	3	2	1	Lesson 1. General information on accumulator batteries. 1. Purpose of accumulator batteries and requirements for them. 2. Electrochemical processes occurring during the operation of accumulators. 3. Main characteristics of lead-acid accumulators. 4. Conventional designation of accumulator batteries.
2.	Group session	3	2	1	Lesson 2. Structure of accumulator batteries. 1. Structure, operation, and types of accumulator batteries. 2. Design features of different types of batteries. 3. Design features of batteries installed on military automotive equipment.
3.	Group session	3	2	1	Lesson 3. Equipment for charging accumulator batteries. 1. Types of charging units. Rectifiers. 2. Electromechanical converters. Charging stations. 3. Optimisation of charging unit operation. 4. Charging accumulator batteries with low currents.
4.	Practical session	6	4	2	Lesson 4. Operation of accumulator batteries. 1. Bringing new accumulator batteries into operational condition. 2. Main methods of charging accumulator batteries. 3. Inspection and maintenance of accumulator batteries.
5.	Group session	4	2	2	Lesson 5. Structure and operation of generators. 1. Purpose, general structure, and operation of direct current generators. 2. Purpose, general structure, and operation of alternating current generators.

					3. Design and operational features of brushless generators.
6.	Practical session	6	4	2	Lesson 6. Structure and operation of generators. 1. Inspection of direct current generator components using an ohmmeter. 2. Inspection of alternating current generator components using an ohmmeter. 3. Inspection of the brush assembly of direct and alternating current generators.
7.	Group session	3	2	1	Lesson 7. Voltage regulators. 1. Structure and operation of contact voltage regulators. 2. Structure and operation of electronic voltage regulators. 3. Integrated voltage regulators.
8.	Group session	4	2	2	Lesson 8. Operation of generator units. 1. Maintenance of generator units. 2. Malfunctions of generators and voltage regulators, methods for their detection and elimination. 3. Features of the operation of alternating current generator units with electronic voltage regulators.
9.	Practical session	4	4		Lesson 9. Inspection and testing of accumulator batteries and generators. 1. Means of testing and maintaining accumulator batteries. 2. Inspection and testing of alternating current generators. 3. Inspection and testing of voltage regulators. 4. Modular assessment.
Section 2. Consumers of electrical energy in automobiles.					
		24	16	8	Topic 2. Ignition and engine electrical starting system.
10.	Lecture	4	2	2	Lesson 1. General information on the engine electrical starting system. 1. Requirements for engine electrical starting systems. 2. General structure of engine electrical starting systems. 3. Classification of starters and their technical characteristics.
11.	Group session	4	2	2	Lesson 2. Structure of starters. 1. Structure and operating principle of the ST2 starter. 2. Structure and operation of the electrical starting system of the ZIL-131 vehicle. 3. Design and operational features of engine electrical starting systems.
12.	Practical session	6	4	2	Lesson 3. Structure and operation of engine electrical starting systems. 1. Structure and operation of the ST2 starter. 2. Inspection of main starter components using an ohmmeter. 3. Inspection of the operation of the auxiliary relay in the electrical starting system. 4. Inspection of the operation of the auxiliary relay circuit in the electrical starting system.
13.	Group session	3	2	1	Lesson 4. General information on the ignition system. 1. Purpose and requirements for ignition systems. 2. Electrical circuits and general structure of ignition systems.

					3. Purpose, structure, and operating principle of the main components of the ignition system.
14.	Practical session	5	4	1	Lesson 5. Structure and operation of the contact ignition system. 1. Structure and operation of the main components of ignition systems. 2. Inspection of the operation of low-voltage circuit components of the ignition system. 3. Inspection of the operation of the low-voltage circuit of the ignition system. 4. Inspection of the condition of spark plugs using devices model E203-O and model E203-P.
15.		2	2		Differentiated Credit
Total for the semester		60	40	20	
Semester 6					
		18	12	6	Topic 2. Ignition and engine electrical starting system.
16.	Group session	4	2	2	Lesson 1. Electronic ignition systems. 1. Contact-transistor ignition systems. 2. Structure and operation of the contact-transistor ignition system of an automobile. 3. Non-contact ignition systems. 4. Structure and operation of the emergency vibrator.
17.	Group session	4	2	2	Lesson 2. Electromechanical and electronic ignition systems. 1. Operating principle and structure of the magneto. 2. Microprocessor ignition system (UAZ 315195 “Hunter”). 3. Operation of the microprocessor ignition system.
18.	Practical session	6	4	2	Lesson 3. Structure and operation of ignition systems. 1. Structure and operation of the main components of the contact-transistor ignition system. 2. Inspection of the operation of low-voltage circuit components of the contact-transistor ignition system. 3. Inspection of the operation of the low-voltage circuit of the emergency ignition system. Methodology for detecting and eliminating malfunctions in non-contact ignition systems.
19.	Practical session	4	4		Lesson 4. Inspection of the operation of the ignition and engine electrical starting system. 1. Inspection and adjustment of ignition on the GAZ-53 engine with a contact-transistor ignition system. 2. Inspection and adjustment of ignition on the ZIL-131 engine with a non-contact ignition system. 3. Modular assessment.
		32	22	10	Topic 3. Control systems, measuring instruments, lighting, and signalling systems.
20.	Lecture	4	2	2	Lesson 1. General information on control systems, measuring instruments, lighting, and signalling systems. 1. Purpose, composition, and requirements for control systems, measuring instruments, lighting, and signalling systems. 2. Structure and operation of control and measuring instruments. 3. Formation of the headlamp light beam. Requirements for signalling devices.
21.	Group session	4	2	2	Lesson 2. Structure and operation of measuring instruments. 1. Structure and operation of temperature and pressure sensors.

					<ul style="list-style-type: none"> 2. Structure and operation of fuel level sensors. 3. Structure and operation of sensors for monitoring temperature and pressure. 4. Structure and operation of temperature, pressure, and fuel level indicators.
22.	Group session	3	2	1	<p>Lesson 3. Structure and operation of lighting devices.</p> <ul style="list-style-type: none"> 1. Structure of headlights. Structure of front and rear lights. 2. Structure of light-masking devices. 3. Structure and operation of main and auxiliary light switches.
23.	Group session	3	2	1	<p>Lesson 4. Structure of the electro-optical converter and rules for using night vision devices.</p> <ul style="list-style-type: none"> 1. Structure and operation of night vision devices. 2. Structure of the electro-optical converter.
24.	Group session	4	2	2	<p>Lesson 5. Structure and operation of light signalling devices.</p> <ul style="list-style-type: none"> 1. Structure and operation of turn signal interrupters. 2. Structure and operation of brake signal switches. 3. Structure and operation of fuses.
25.	Group session	3	2	1	<p>Lesson 6. Structure of vehicle lighting systems.</p> <ul style="list-style-type: none"> 1. Lighting system of the tracked vehicle GM-569. 2. Design features of the electrical equipment system of the tracked vehicles GM-569 and MT-LB. 3. Lighting and light signalling systems of the wheeled chassis MAZ-537 and BAZ-5937.
26.	Practical session	5	4	1	<p>Lesson 7. Operation of lighting and signalling devices.</p> <ul style="list-style-type: none"> 1. Structure and operation of the lighting system. 2. Inspection of the operation of signalling system devices. 3. Inspection of the functionality of fuses, switches, and relays using an ohmmeter (multimeter).
27.	Practical session	4	4		<p>Lesson 8. Inspection of the operation of lighting, signalling, and measuring instruments.</p> <ul style="list-style-type: none"> 1. Structure and operation of measuring instruments of the fuel system. 2. Inspection of the operation of signalling system devices. 3. Modular assessment.
		40	32	8	Topic 4. Additional and electronic equipment of automobiles.
28.	Lecture	3	2	1	<p>Lesson 1. Electronic control systems.</p> <ul style="list-style-type: none"> 1. Purpose and classification of electronic control systems. 2. Fundamentals of the structure of control systems.
29.	Group session	5	4	1	<p>Lesson 2. Electronic (microprocessor) engine control systems.</p> <ul style="list-style-type: none"> 1. Electronic control systems for petrol engines. 2. Electronic control systems for diesel engines. 3. Electronic valve control system. 4. Automatic control systems for the forced idle economiser.
30.	Group session	4	2	2	Lesson 3. Transmission, suspension, and brake control systems.

					<ol style="list-style-type: none"> 1. Structure and operation of transmission control systems. 2. Structure and operation of suspension control systems. 3. Structure and operation of brake control systems.
31.	Group session	4	2	2	Lesson 4. Cabin equipment control systems. <ol style="list-style-type: none"> 1. Diagnostic systems. Security systems. 2. Navigation equipment. 3. Cabin climate control systems.
32.	Group session	4	2	2	Lesson 5. Additional electrical equipment of automobiles. <ol style="list-style-type: none"> 1. Radio interference suppression devices. 2. Audible signalling system. 3. Life support systems.
33.	Practical session	6	4	2	Lesson 6. Electric drive. <ol style="list-style-type: none"> 1. Speed regulation of the windscreen wiper motor. 2. Speed regulation of the cabin heater motor. 3. Structure and operation of electric drives for the windscreen wiper and engine cooling system fan.
34.	Group session	4	2	2	Lesson 7. Features of the electric drive system of base vehicles. <ol style="list-style-type: none"> 1. Torque converter locking mechanisms. 2. Control system for the hydromechanical transmission of the GM-569. 3. Electrical power supply system of the tracked vehicle GM-569.
35.	Group session	4	2	2	Lesson 8. Structure and operation of vehicle electrical equipment. <ol style="list-style-type: none"> 1. Structure and operation of the engine preheater electrical circuit. 2. Structure and operation of pneumatic-electric valves of automobiles. 3. Structure and operation of the electric fuel pump.
36.	Practical session	6	6		Lesson 9. Inspection and testing of additional and electronic equipment of automobiles. <ol style="list-style-type: none"> 1. Structure and operation of the engine preheater system of the ZIL-131. 2. Structure and operation of the engine preheater system of the KamAZ-740 (PZhD-30). 3. Structure and operation of the electro-torch preheater type "Thermostart". 4. Modular assessment.
Total for the semester		84	60	24	
Total for the discipline		150	100	50	