COURSE DESCRIPTION CARD - SYLLABUS

Course name

Diagnostics, handling and repair of motor vehicles

Course

Field of study

Mechanical and Automotive Engineering

Year/Semester

4/7

Area of study (specialization)

Motor Vehicles

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

45

Laboratory classes

15

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

Ph.D. (Eng.), D.Sc. Marian Jósko, Assoc. Prof.

email: marian.josko@put.poznan.pl

tel. 61 665 22 47

Faculty of Civil and Transport Engineering

Piotrowo street 3, 60-965 Poznan

Responsible for the course/lecturer:

Ph.D. (Eng.) Dariusz Ulbrich

email: dariusz.ulbrich@put.poznan.pl

tel. 61 665 22 48

Faculty of Civil and Transport Engineering

Piotrowo street 3, 60-965 Poznan

Ph.D. (Eng.) Jerzy Kupiec

email: jerzy.kupiec@put.poznan.pl

tel. 61 665 2709

Faculty of Civil and Transport Engineering

Piotrowo street 3, 60-965 Poznan

Prerequisites

KNOWLEDGE:

Has basic knowledge of manufacturing techniques used in the engineering industry, such as casting, plastic working, reduction and incremental machining, welding and other techniques of joining materials, cutting, coating and surface treatments. Has a basic knowledge of the tribological processes occurring in machines, i.e. friction, lubrication and wear. He is aware of the latest trends in machine construction, i.e. automation and mechatronization, automation of machine design and construction processes, increased safety and comfort of operation, and the use of modern construction materials.

The student has basic knowledge of the construction, operation and maintenance of motor vehicles and their assemblies, has basic knowledge in the field of automotive electronics.

SKILLS:

Can search catalogs and manufacturers' websites for ready-made machine components to be used in their own projects. He can develop an instruction manual and repair a simple machine from a group of machines covered by a selected specialty. He can organize and substantively manage the process of designing and operating an uncomplicated machine from a group of machines from the group covered by a selected specialty. Has the ability to self-educate with the use of modern didactic tools, such as remote lectures, websites and databases, teaching programs, e-books.

The student is able to integrate the obtained information, interpret it, draw conclusions, formulate and justify opinions, has the ability to perceive, associate and interpret phenomena occurring during the work of individual systems.

SOCIAL COMPETENCES:

Is aware of the recognition of the importance of knowledge in solving cognitive and practical problems and consult experts in the event of difficulties in solving the problem on their own. Is willing to think and act in an entrepreneurial manner.

The student is aware of the importance of the technical efficiency of the vehicle and understands the technical aspects and consequences of the failure for road safety.

Course objective

The objective of the course is to familiarize students with all general issues related to the handling, repair and diagnostics of motor vehicles as well as with the methods of handling, repairing and diagnosing car chassis and body systems, as well as developing the ability to use these methods in engineering practice.

Course-related learning outcomes

Knowledge

M1_W14. Has basic knowledge of manufacturing techniques used in the engineering industry, such as casting, forming, reducing and incremental machining, welding and other joining techniques, cutting, coating and surface treatments.

M1_W17. Has basic knowledge of tribological processes occurring in machines, i.e. friction, lubrication and wear.

M1_W18. Is aware of the latest trends in machine construction, i.e. automation and mechatronization, automation of machine design and construction processes, increased safety and comfort of operation, the use of modern construction materials.

M1_W20. Has elementary knowledge of the life cycle of machinery, recycling of machine elements and construction and consumables.

Skills

M1_U02. Can search in catalogs and on manufacturers' websites ready-made machine components to be used in his own projects.

M1_U09. Can develop a manual and repair a simple machine from the group of machines covered by the selected certification path.

M1_U13. Can design the technology behind a simple machine element as well as the technology for assembling and disassembling a machine.

M1_U14. Can plan and carry out the process of constructing uncomplicated machinery units or machines and formulate requirements for electronic components and automatic control systems for industry specialists in mechatronic systems.

M1_U20. Can use the experience gained in an environment professionally involved in engineering activities related to the maintenance of devices, facilities and systems typical for the field of study.

M1_U25. Can organize and substantively manage the process of designing and operating a simple machine from a group of machines from the group covered by the selected diploma path.

Social competences

M1_K02. Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on its own.

M1_K04. Is ready to initiate actions for the public interest.

M1_K05. Is willing to think and act in an entrepreneurial manner.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written examination, consisting of 6 questions, covering general issues of handling, diagnostics and repair of motor vehicles, service, repair and diagnostics of a selected internal combustion engine system as well as handling, repair and diagnostics of the indicated car chassis system or its element.

Credit for the practical and laboratory parts will be based on the grades of reports and tests.

Programme content

Handling:

1. The genesis of servicing of motor vehicles. Influence of design, production and utility factors on the process and scope of handlig. Justification of handling resulting from the wear of the vehicle components (Lorenz curve and damage intensity). The place of technical handling in the chronological order of the car's life cycle.

2. System of terms and handling terminology related to the operation of a motor vehicle - servicing, handling and inspection, service life, renewal, maintenance of the car, operational potential, physical and moral wear, generating of clearances, durability, etc.

3. Vehicle handling systems resulting from the strategy of their operation. Fitness and unfitness of a motor vehicle. Principles and tendencies in handling of motor vehicles. Schedules of operations, treatments and handling activities. Means of performing of the handling (equipment, materials, infrastructure). Personnel for handling - their features and motivations.

4. Criteria for division and classification of handling activities. Technical support groups. Types of handling, their characteristics and analysis. Upper and lower order handling. Periodic technical handling (basic and extended). Service networks. Service outsourcing, service contracts and fleet customer. Structure of the national handling and repair system.

5. Influence of operating conditions on vehicle handling plans and handling scopes. Handling of the internal combustion engine systems of a motor vehicle (piston and crank, timing, power, lubrication-lubrication, cooling, ignition, electric and electronic assemblies, fuselage and head, additional equipment and devices).

6. Handling of the car body, with particular emphasis on cosmetic handling and undercarriage systems of a motor vehicle (drive - driving, braking, steering, suspension). Handling of attachments and nodes exposed to intense wear. Comfort systems support - air conditioning, heater.

7. The specificity of handling of hybrid and electric cars and examples of handling critical components of these vehicles. Sources of service, handling and repair data for vehicles with combustion engines and in the case of alternative drive sources in the light of the Act on electromobility and alternative drives of 11/01/2018.

Repair:

1. Justification for repair of motor vehicles and examples of malfunctions defining the scope of repairs. The operational and treatment structure of the repair process and the characteristics of major operations. Repair terminology - scope, effort, cost. Criteria for division and types of repairs. Organizational methods of repairing motor vehicles. Repair kits.

2. Dismantling of assemblies and sub-assemblies. Completion of parts and assembly of assemblies. Verification of parts - stages and methods of verification. Part qualification criteria during verification. Sensory verification with examples. Measuring instruments and dedicated verification devices. Application of defectoscopic methods to verify parts of vehicle. Detailed overview of the verification of selected parts of a motor vehicle.

3. Technologies for repairing systems and mechanisms of passenger vehicles and trucks. Examples of repairs of selected systems or accessories of motor vehicles, specifying the cause of repair, the so-called assembly hall. Regeneration of parts of motor vehicles. Criteria and methods of regeneration and limitations of its use.

4. Repair of the engine and its systems. Repair of the body, head and piston-crank system of an internal combustion engine. Repair of the brake system. Turbocharger repair. Repair of the drive system, final drive and differential of a motor vehicle. Repair of the steering system and vehicle suspension. Car air conditioning system repair.

5. Accident repairs of vehicle bodies. Aims and tasks of post-accident repairs. Body repair technologies. Body and paint shop and its equipment. Bodywork repair technology. Renovation varnishing technologies. Restoration materials.

6. Safety issues in vehicle maintenance and repairs. Requirements for the condition and equipment of road transport facilities. Functions of the depot, plant and repair shop for the provision of maintenance and repair services. Identification of hazards occurring in the implementation of vehicle handling and repair tasks and ways to reduce their effects. Principles of compliance with the principles of safe work at the handling and repair stands.

Diagnostics:

1. The scope and methods of diagnosing of the working space, timing system, cooling system and the lubrication system of internal combustion engines. Basics of using vibroacoustics to diagnose an internal combustion engine.

2. Diagnostics of SI and CI engine power supply systems.

3. Possibilities of diagnosing modern ignition systems, including coils, spark plugs. Oscilloscope diagnostic methods. Diagnosing the power supply and the starting circuit. Vehicle lighting - diagnostic methods.

4. Diagnostics of the driving system and suspension of motor vehicles: indication of possible sources of deterioration of the technical condition of these systems, scope and methods of diagnosing the suspension system, visual inspection, instrument methods, diagnosis of leading elements and their connections, methods of verification of shock absorbers and elastic elements.

5. Diagnostics of the steering system: conditions to be met by an efficient steering system, possible sources of deterioration of the technical condition, diagnostic parameters, methods of diagnosis, universal diagnostic instruments mechanical-optical and optical, system geometry, diagnosis of power steering systems.

6. Diagnostics of braking systems: possible sources of deterioration of the technical condition or inefficiency of this system, diagnostics of actuating, supporting and executive mechanisms, assessment of the effectiveness of the braking system using instrument methods, roller devices, decelerators, overrun plates.

7.Diagnostics of the drive system: possible sources of deterioration of its technical condition, presentation of general diagnostic parameters (power on wheels, coasting path, fuel consumption), diagnostics of the clutch, gearbox, drive shaft and drive axle, diagnostic instruments, inertial and load chassis dynamometers .

8. OBD (on-board diagnostics): definition of basic terms, general principles of OBD systems operation, characteristics of diagnostic information in OBD systems, on-board diagnostics system monitors. Diagnostic information and communication in the on-board diagnostics system, directions of development of motor vehicles, on-board diagnostics of other vehicle units.

Teaching methods

1. Lecture with a multimedia presentation - a combination of an information and problematic lecture.

2. Laboratory exercises - performing the tasks given by the teacher - practical exercises.

3. Auditorium exercises - acquiring knowledge in practice.

Bibliography

Basic

1. Jósko M., Ulbrich D., Kowalczyk J., Mańczak R., Nosal S.: Inżynieria odnowy pojazdów samochodowych, tom 1, Inżynieria obsługiwania; Wydawnictwo Politechniki Poznańskiej, Poznań, 2019.

2. Jósko M., Ulbrich D., Kowalczyk J., Mańczak R., Nosal S.: Inżynieria odnowy pojazdów samochodowych, tom 2, Inżynieria naprawy; Wydawnictwo Politechniki Poznańskiej, Poznań, 2019.

3. Wróblewski P.: Naprawa podzespołów i zespołów pojazdów samochodowych. WKiŁ, Warszawa, 2016.

4. Wróblewski P., Kupiec J.: Diagnozowanie podzespołów i zespołów pojazdów samochodowych. WKiŁ, Warszawa, 2015.

5. Kozłowski M. (red.): Budowa i eksploatacja pojazdów, t. II - Obsługa, diagnostyka i naprawa zespołów i podzespołów. Wyd. Vogel Business Media, Wrocław, 2008 and subsequent editions.

6. Uzdowski M., Abramek K., Garczyński K.: Pojazdy samochodowe. Eksploatacja techniczna i naprawa. WKiŁ, Warszawa, 2008 and subsequent editions.

7. Trzeciak K.: Wyposażenie warsztatów samochodowych. Wyd. Auto, Warszawa, 2005.

8. Niziński S.: Diagnostyka samochodów osobowych i ciężarowych. Dom wydawniczy Bellona, Warszawa, 1999.

Additional

1. Rzeźnik C., Durczak K., Rybacki P.: Serwis techniczny maszyn. Wyd. Uniwersytetu Przyrodniczego w Poznaniu, Poznań, 2015.

2. Nosal S.: Inżynieria odnowy maszyn. Wybrane zagadnienia. Wyd. Politechniki Poznańskiej, Poznań, 2017.

3. Orzełowski S.: Naprawa i obsługa pojazdów samochodowych. WSziP, Warszawa, 2008 and subsequent editions.

4. Livesey W.A., Robinson A.: The repair of vehicle bodies. Elsevier, London, New York, Tokyo, 2005.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	75	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	50	2,0

[1] delete or add other activities as appropriate