COURSE DESCRIPTION CARD - SYLLABUS

Course name
Supercharging of internal combustion engines

Course

Field of study
Construction and Exploitation of Means of Transport

Year/Semester
1/2

Area of study (specialization)
Internal Combustion Engines

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
18

Laboratory classes
0

Other (e.g. online)
0

Tutorials
9

Projects/seminars
0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
DSc. DEng. Piotr Lijewski prof. PUT

Responsible for the course/lecturer:
second person allowed

Prerequisites

KNOWLEDGE: the student has basic general knowledge about the construction of the surrounding world and the laws that govern it

SKILLS: the student is able to integrate the obtained information, interpret it, draw conclusions, formulate and justify opinions

SOCIAL COMPETENCES: the student is aware of the social and economic importance of environmental protection

Course objective

The aim of the course is to teach the definition and general principles of using supercharging in internal combustion engines, as well as the methods and limits of supercharging; indication of the possibility of shaping the characteristics of engines by adjusting the boost parameters and controlling the boost; getting acquainted with various design solutions of boost systems. Students will also learn the basics of model description of selected processes, including charging processes, charge air cooling and energy balance in various boost regulation systems.

Course-related learning outcomes

Knowledge

1. Has extended knowledge of selected departments of technical mechanics related to the selected specialization.

2. Has in-depth knowledge of the construction and principles of operation as well as classification of machines from a selected group.

Skills

1. Can formulate and test hypotheses related to simple research problems.

2. Can plan and carry out experimental research of specific processes taking place in machines and routine tests of a working machine or a vehicle from a selected group of machines.

3. Can communicate on specialist topics with a diverse audience

Social competences

1. Is ready to critically assess the knowledge and content received.

2. 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.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written / oral exam. Final credit of exercises

Programme content

Definition and purpose of using a supercharging. Supercharging systems. Historical view. Main features. Supercharging degree. Supercharging limits. Theoretical and real circuits of supercharged engines. Compressor free supercharging. Systems with variable geometry. Mechanical supercharging: screw, Roots, G and other compressors. Constant pressure and pulsed turbocharging. Multistage and range recharges. Supercharging regulation problems. Shaping the engine characteristics through the supercharging characteristics. The principle of operation and the design of the combined supercharging. Unconventional The principle of operation and the design of the combined supercharging systems: COMPREX, HYPERBAR, compound and differential The principle of operation and the design of the combined supercharging. Power turbine. Superthermal system. Charge air cooling. Calculation rules for the charge air cooler. Turbo cooling. Features of selected design nodes of supercharged engines. Supercharging of low-speed engines. Supercharging and fuel consumption and emission of toxic compounds. Computational selection of a turbine for an engine.

Teaching methods

1. Lecture with multimedia presentation

2. Exercises - solving problems

Bibliography

Basic

1. Wisłocki K.: Systemy doładowania szybkoobrotowych silników spalinowych. WKiŁ, Warszawa 1992, ss. 356

2. Kowalewicz A.: Doładowanie silników spalinowych. Politechnika Radomska 1998 r.

3. Mysłowski J.: Doładowanie silników spalinowych. WKiŁ, Warszawa 2002 r.

4. Rychter T., Teodorczyk A.: Teoria silników tłokowych. WKiŁ, Warszawa 2006, ss. 270

Additional

1. Materials of engine producers, conference and industry materials: Combustion Engines, MTZ, SAE

Breakdown of average student's workload

	Hours	ECTS
Total workload	77	3,0
Classes requiring direct contact with the teacher	27	1,0
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