



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Supercharging the Internal Combustion Engines

Course

Field of study

Construction and Exploitation of Means of Transport

Area of study (specialization)

Internal Combustion Engines

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

0

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

Prof. Krzysztof Wislocki, DSc, DEng.

Responsible for the course/lecturer:

Filip Sz wajca, ME, Doctoral Student

Prerequisites

Completion of basic courses in mechanics, physics, thermodynamics, technical drawing, theory of IC engines

Course objective

Teaching the students of fundamentals, definitions and principles of supercharging in combustion engines as of the method of power concentration increasing in combustion engines. Student are getting familiar with possible methods of supercharging and their restrictions; systematization of charging methods and charging control. Describing and explanation of full-load characteristic shaping by application of the variety of charging control systems. Teaching the variants of turbocharging control. Discussion on various constructions of super- and turbocharging. Students learn the fundamentals of mathematical modelling of charging process, inlet air cooling and energetic balance for various supercharging systems.

Course-related learning outcomes

Knowledge

The student has overall knowledge concerning mechanics, physics, chemistry, technical drawing,



material strength, design and operating of internal combustion engines, suitable to I level of technical studies.

Skills

The student is able to integrate acquired information, to interpret them, formulate conclusions and justify opinions, especially concerning processes and phenomena occurring in combustion engines; he demonstrates also technical type of thinking, associating of cause and effect relationships in mechanics, physics and chemistry.

Social competences

The student is aware of social and economic meaning and importance of energy and resources wearing; he demonstrates his own independence in solving technical problems, acquiring and improving of his knowledge and skills.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written or oral examination, semestral work, computing exercises.

Programme content

Definition and target of application of supercharging in internal combustion engines. Systematization of supercharging systems and their applications. Historical description of supercharging. Features and properties of supercharging systems. Restrictions of supercharging. Theoretical and real cycles in supercharged engines. Non-compressor supercharging: basics and fields of application. Variable geometry turbocharging: principles and practical applications. Mechanical-driven supercharging: Roots-blower, G-charger and others. Constant-pressure turbocharging and pulse-charging. Multistage- and sequential turbocharging. Problems with turbocharging control. Engine full-load characteristic shaping by charging pressure control. Principles and design of combined turbocharging. Unconventional systems of supercharging: Compex, Hyperbar, Differential system. Engines with Power-turbine. System Superthermal. Charged air cooling: principles and systems. Turbocooling. Main features of selected elements of charged engines. Turbocharging in low-speed marine-type engines. Fuel consumption and toxic compound pollution vs. charging pressure and temperature. Computational adjustment of turbocharger to the engine.

Teaching methods

1. Lectures including multimedia presentations. 2. Computing exercises.

Bibliography

Basic

1. Wiśłocki K.: Systemy doładowania szybkoobrotowych silników spalinowych. WKiŁ, Warszawa 1992, ss. 356.
2. Kowalewicz A.: Doładowanie silników spalinowych. Politechnika Radomska 1998 r.



3. Zinner K.: Aufladung von Verbrennungsmotoren, Springer-Verlag, I-IV Auflage, -1985
4. Watson N., Janota M.: Turbocharging the internal combustion engines, The MacMillan Press Ltd., London 1982.

Additional

1. Mysłowski J.: Doładowanie silników spalinowych. WKiŁ, Warszawa 2002 r.
2. Pucher H.: Aufladung von Verbrennungsmotoren. Kontakt und Studium, B. 133, Expert Verlag 1985.
3. Hiereth H., Prenninger P.: Aufladung von Verbrennungskraftmaschinen. Springer Verlag, 2003.

Breakdown of average student's workload

	Hours	ECTS
Total workload	80	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	35	1,0

¹ delete or add other activities as appropriate