COURSE DESCRIPTION CARD - SYLLABUS

Course name
Combustion engines [N1MiBP1>SSp]

Course

Field of study
Mechanical and Automotive Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
9

Laboratory classes
9

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Knowledge: In the basic scope, it concerns the operation of internal combustion engines. Basic in chemistry and physics from high school. In terms of the main elements of the drive systems. Skills: Logical thinking, learning comprehension, using textbooks and searching for information from scientific publications (including the ability to search online databases). Social competence: Awareness of the need to acquire knowledge and use it in various fields of technical and natural sciences.

Course objective

The aim of the course is to get acquainted with issues related to internal combustion engines in the field of: history, theoretical basis, construction, thermodynamics, research, emissivity, modern solutions and their application: road and off-road vehicles, aviation, shipbuilding.

Course-related learning outcomes

Knowledge:
Has basic knowledge of the basics of machine design and the theory of machines and mechanisms, including mechanical vibrations.
Has basic knowledge of the technical mechanics of fluids, i.e. ideal liquids and gases, Newtonian and

non-Newtonian viscous liquids, theory of thermal-flow machines..
Has extended basic knowledge necessary to understand specialist subjects and specialist knowledge about the construction, construction methods, manufacturing and operation of a selected group of working, transport, thermal and flow machines covered by the diploma path..
Has elementary knowledge of the impact of machinery and technology on the natural environment and global energy balances..

Skills:
Can obtain information from literature, the Internet, databases and other sources. Can integrate the obtained information, interpret and draw conclusions from it, and create and justify opinions..
Can competently advise on the selection of a machine for a given application in the industry covered by the selected diploma path based on the acquired knowledge about a given group of machines.
Can perform elementary technical calculations in the field of fluid mechanics and thermodynamics, such as heat and mass balances, pressure losses in pipelines, select parameters of blowers and fans for ventilation and transport systems, and calculate thermodynamic courses in thermal machines.
Can create a system diagram, select elements and perform basic calculations using ready-made computational packages of mechanical, hydrostatic, electric or hybrid machine drive system.
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.
Can interact with other people as part of teamwork (also of an interdisciplinary nature).

Social competences:
Is ready to critically assess his knowledge and received content.
Is ready to fulfill social obligations and co-organize activities for the benefit of the social environment.
Is ready to fulfill professional roles responsibly, including:
- observing the rules of professional ethics and requiring this from others,
- caring for the achievements and traditions of the profession.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Assessment on the basis of a written exam during the examination session and completed laboratory classes (reports + tests).

Programme content

The following issues will be presented in the program content:
-Introduction: presentation of a steam engine and a combustion engine, the principle of operation of a two-stroke and four-stroke engine, basic elements, types, application, a brief historical overview.
-Construction of the internal combustion engine: main components, power systems, supercharging, construction problems.
-The theory of the internal combustion engine: theoretical and comparative cycles, indicator charts, definitions of basic work indicators, Sankey diagram.
-Tests of internal combustion engines: construction of an engine dynamometer, dynamic dynamometer, engine characteristics, RDE tests.
-Emission of pollutants from internal combustion engines: emission sources, characteristics of the main harmful compounds, combustion reaction, dependence of operating parameters on emissions.
-Modern solutions used in internal combustion engines: directions of development of power systems, EGR, downsizing, rightsizing, downrating, variable valve timing, electric compressors, Atkinson cycle, Miler cycle, presentation of the design of selected modern internal combustion engines.
-High power combustion engines and aircraft structures.
-Application of internal combustion engines on selected examples.

Teaching methods

1. Lecture with multimedia presentation
2. Laboratories - problem solving

Bibliography

Basic
1. Serdecki W. (red.): Badania silników spalinowych - Laboratorium (Combustion engine research - Laboratory). WPP, Poznan, 2012 or later releases.
2. Wajand Jan A., Wajand Jan T.: Tłokowe silniki spalinowe średnio- i szybkoobrotowe (Medium and high speed reciprocating internal combustion engines). WNT, Warsaw, 2005.
3. Niewiarowski K.: Tłokowe silniki spalinowe (Reciprocating internal combustion engines). WKiŁ, Warsaw, 1983.
4. Merkisz J.: Ekologiczne problemy silników spalinowych (tom I i tom II) (Ecological problems of internal combustion engines (volume I and volume II)). WPP, Poznań, 1998.
Additional
1. Engine manufacturer materials, conference and industry materials: Combustion Engines, MTZ, SAE.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	18	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	57	2,00