COURSE DESCRIPTION CARD - SYLLABUS

Course name

Vehicle passive safety (crashworthiness)

Course

Field of study	Year/Semester
Mechanical and Automotive Engineering	2/2
Area of study (specialization)	Profile of study
Motor vehicles	general academic
Level of study	Course offered in
Second-cycle studies	polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	0	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

dr inż. Mikołaj Spadło

mikolaj.spadlo@ put.poznan.pl

tel. 61 665 22 22

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge: Students knows the basics of general mechanics, car motion theory, strength of metal materials, materials science, electrical engineering and is familiar with numerical methods of design support.

Skills:The student Is able use the languages: native and international at a level sufficient to enable understanding of technical texts. Is able to obtain information from the literature, internet, databases and other sources. Can integrate the information to interpret and learn from them, create and justify opinions.

Social competencies: Understands the need and knows the possibilities of lifelong learning.

Course objective

Providing students with knowledge regarding safety and comfort systems used in automotive vehicles. In particular: discussion of the physical basis of phenomena occurring during vehicle collisions and description of the principles of operation and methods of constructing systems reducing the effects of road accidents implemented in motor vehicles.

Course-related learning outcomes

Knowledge

Has knowledge of the principles of safety and ergonomics in the design and operation of machines and the threats that machines pose to the natural environment.

Has extended knowledge of the standards for working machines in the field of methods of calculating and testing machines, safety, including road safety, environmental protection as well as mechanical and electrical interface.

Has extended knowledge of the life cycle of machines, the principles of operation of working machines and destructive processes occurring during operation, such as tribological wear, corrosion, surface fatigue and volumetric aging of the material.

Skills

He can correctly select the optimal material and its processing technology for typical parts of working machines, taking into account the latest achievements in material engineering.

He can estimate the potential threats to the environment and people from the designed working machine and vehicle from a selected group.

Can communicate on specialist topics with a diverse audience.

Social competences

He is ready to critically assess his knowledge and received content.

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.

Is ready to fulfill professional roles responsibly, taking into account changing social needs, including:

- developing the professional achievements,

- maintaining the ethos of the profession,

- observing and developing the rules of professional ethics and acting towards the observance of these rules.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam in the form of a test containing selection, descriptive and problem questions as well as calculation tasks.

Programme content

1.Definition of passive safety, traffic accident statistics, trends, social and financial consequences of road accidents, risks and threats on the roads.

2.Physical phenomena accompanying car collisions, differences between collision and braking, physical models of collision, delays and forces, including modeled and real graphs, crash compatibility, accident classification, crash tests.

3.Basics of biomechanics of injuries, historical outline of safety systems and related legislation, definition of damage and injury, mechanisms of human injury, indicators of the severity of head, neck, torso and leg injuries.

4.Structure of the body car, zones in the vehicle structure, methods of shaping passive strength, body repairs, endurance and frontal collisions, capacity of crushed beams, concepts of local and global buckling.

5.The mechanism of passenger protection with safety belts, historical outline, construction and types of conventional seat belts. Automatic seat belts.

Belt tensioners construction and types. Belt seat belt tensioners, special seat structures, headrests.

6.Front, side and special airbags, types, purpose, functioning, requirements. Gas generators by solid fuel and hybrid fuel cushion systems, advantages and disadvantages, electrical connection system. Multi-stage gas cushions, tension belts before crash, adaptive belt tension limiters. Adaptive geometry of seats and headrests.

7.Structure of current passive safety systems, construction of sensors used in modern passive safety systems (collision and safety sensors). Additional sensors in passive safety systems, passive safety systems controllers. Child protection systems.

8.Intelligent comfort systems in automotive vehicles (automatic air conditioning systems, automatically activated and adjustable wipers, central locks, electrically raised windows). Driver's assistance systems. Parking systems. Augmented reality and its use of the vehicle.

Teaching methods

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

Bibliography

Basic

1. Wicher J.: Bezpieczeństwo samochodów i ruchu drogowego, WKiŁ, Warszawa 2002,

2. Rokosch U.: Poduszki gazowe i napinacze pasów. WKiŁ, Warszawa 2003,

3. Seiffert U., Wech L.: Automotive Safety Handbook, SAE International, Warrendale, 2007,

4. Safety, Comfort and Convenience Systems, Robert Bosch GmbH, 2006,

5. Bosch Automotive Handbook –8th edition, Bentley Publishers, 2010,

6. Wypadki drogowe. Vademecum biegłego sądowego, Wydawnictwo Instytutu Ekspertyz Sądowych, Kraków 2011.

Additional

1. Webpages: www.autoliv.com, www.mira.co.uk

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,0
Classes requiring direct contact with the teacher	15	0,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	10	0,5

[1] delete or add other activities as appropriate