



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Vehicle passive safety (crashworthiness)

### Course

Field of study

Year/Semester

Construction and Exploitation of Means of Transport

1/2

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:

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

### 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 to 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

1. The student knows the dangers associated with the movement of motor vehicles
2. The student knows the types, construction and operation of systems that increase passive safety and comfort in vehicles

#### Skills

1. The student can define the mechanisms of injury of passengers during the impact and their physical basis.
2. The student can interpret the possibilities and manner of ensuring protection of car passengers using passive safety devices.
3. The student can correctly use passive safety devices in the car.
4. The student can assess the possibilities of diagnosing and acceptable repairs of passive safety devices in cars.
5. The student can define the meaning and basic principles of the functioning of comfort systems in a car.

#### Social competences

1. The student is aware of the risks accompanying the movement of the car.
2. The student is aware of the limits of immunity of the human body and the possibility of protecting the body against the occurrence of injuries by means of technical means used in modern vehicles.
3. The student is aware of the need to disseminate knowledge about the possibilities, limitations and proper use of technical passive safety devices and comfort for improving safety.

### 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](http://www.autoliv.com), [www.mira.co.uk](http://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) <sup>1</sup>	10	0,5

<sup>1</sup> delete or add other activities as appropriate