Detailed course description
(SUBJECT CARD)

Course title: APPLIED MECHANICS
Course code: MK2e_1
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 15;
classes – 30;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 5
* – *leave the appropriate option*

1. Course objectives:

   ability to solve technical problems based on the laws of mechanics
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W07	one has extended and advanced knowledge in the field of mathematical methods and analyses applied to describe technical processes, transport systems and processes	lecture, classes	Kolokwium
K2A_W08	one has extended and advanced knowledge in the field of analysis of physical phenomena and solutions of technical problems with the application of the laws of physics in the construction, operation and maintenance of means of transport	lecture, classes	Egzamin
K2A_W09	one has knowledge in the field of materials science and laws of mechanics as well as their application in transport	lecture	Egzamin
K2A_W18	one has well-organised and theoretically grounded knowledge in the field of applied mechanics	lecture	Egzamin
Skills: a student can			
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	45
Student's workload 1*	20
Student's workload 2*	20
Student's workload n*	60
The other**	5
Total hours:	**150**
Number of ECTS credits allocated to a course	**5**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 45 hours / 1.5 ECTS points
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 45 hours / 1.5 ECTS points
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 105 hours / 3.5 ECTS points
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 45 hours
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Tomasz Haniszewski, dr inż., tomasz.haniszewski@polsl.pl, AleksanderSładkowski, prof. dr hab., aleksander.sladkowski@polsl.pl

7. Detailed description of teaching modes:
   1. 1) lectures: - detailed program content:
   2. Fundamentals of analytical mechanics. Lagrange equations. Forces operating in vibrating systems. Vibration classification. Methods of analysis and synthesis of dynamic systems. Selected elements of vibration theory. Reduction of masses, stiffness and damping. The free vibration of systems with one degree of freedom, taking into account and without taking account of friction. Forced vibrations of systems with one degree of freedom. Resonance curve. Nonlinear vibrations. Vibrations of linear systems with many degrees of freedom. Derivation of equations for free vibrations system with a finite number of degrees of freedom. Eigenfrequencies and eigenvibration forms. Forced vibrations of systems with a finite number of degrees of freedom. Resonance and anti-resonance. The use of FEM to study structure vibrations. - teaching methods used, including distance learning methods and techniques: multimedia presentation, discussion. - form and criteria for passing, including retake rules, as well as the conditions for admission to the exam: written lecture exam (the exam is assessed positively if the student receives at least 50% of points), admission to the exam is dictated by obtaining a positive grade from written test from classes. These rules also apply to credits in correction dates. - organization of classes and rules for participation in classes, with an indication of whether student attendance is obligatory,

presentation of program content in accordance with the subject card (recommended lecture, optional) 2) exercises: - detailed program content: Solving problems of dynamics of systems with 1, 2 or many degrees of freedom. - teaching methods used, including distance learning methods and techniques: discussion, brainstorming, snowball method, consultation, group work, blackboard activities, - form and criteria for passing, including retake rules, as well as the conditions for admission to the exam: obtaining a positive grade from the written test, - organization of classes and rules for participation in classes, with an indication of whether student attendance is obligatory, work on tutorials according to the teacher's instructions, implementation of the program content in accordance with the subject card / attendance is obligatory.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   The final grade is the arithmetic average of the realized forms of activity.

9. Method and procedure for making up for
   3. 1. the student's absence from classes, (making up for absences from classes - depending on the form of missed classes, this is determined by the teacher during consultations in accordance with the forms of conducting classes and the conditions for passing specified in point 7 of this card.

   2. differences in study programs of persons moving from another field of study, from another university or resuming studies at the Silesian University of Technology - Depending on the arrears, it is determined by the teacher during consultations in accordance with the forms of conducting classes and the conditions of passing set out in point 7 of this card.

10. Prerequisites and additional requirements, taking into account the course sequence:
    Ability to perform mathematical calculations at the college level, basic knowledge in the field of: physics, technical mechanics, strength of materials

11. Recommended sources and teaching aids:
    Theory of Vibration, Shabana Ahmed A., Springer 2019, Engineering Vibration Analysis, Svetlitsky Valery A., Springer 2010, Williams, James H., Jr. Fundamentals of Applied Dynamics. John Wiley & Sons, Inc., 1996., Hibbeler, Russell C. Engineering Mechanics: Dynamics. 12th ed. Prentice Hall, 2009.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    The teachers has many years of experience in teaching. They have education in the construction and operation of machines, computer science, general electronics. PhD and / or habilitation thesis conducted in the discipline of mechanical engineering (formerly the construction and operation of machines). Teachers are the authors of thematic publications, e.g .: 1. Model research on crane lifting mechanisms. Monograph. [Aut.]: Jerzy Margielewicz, Tomasz Haniszewski, Damian Gąska, Czesław Pypno. Katowice: Transport Committee. Polish Academy of Sciences. Katowice, 2013, 2. Mechanical properties identification of steel wire rope with fiber core. [Aut.]: Tomasz Haniszewski, Damian Gąska, Jerzy Margielewicz. -SC. J. Sil. Univ. Technol., Ser. Transp. 2014, 3. Modeling the dynamics of cargo lifting process by overhead crane for dynamic overload factor estimation. [Aut.]: Tomasz Haniszewski. -J. Vibroeng. 2017 vol. 19 iss. 1, 4. Chaos in overhead traveling cranes load motion. [Aut.]: Jerzy Margielewicz, Damian Gąska, Tadeusz Opasiak, Tomasz Haniszewski. -Mechanika, [Kauno Technologijos Universitetas] 2019 vol. 25 No. 3. 5.Sładkowski,A. (ed.) Finite element method for transport applications. Gliwice:Politechnika Śląska. 2011. 212 p. ISBN 978-83-7335-876-8. 6. Sładkowski,A. (ed.) Rail vehicle dynamics and associated problems . Gliwice: WydawnictwoPolitechniki Śląskiej. 2005. 188 p. ISBN 83-7335-239-2.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: ECO-PHILOSOPHY AND SOZOLOGY
Course code: MK2e_2
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 30;
classes – 0;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   Presentation of state of art of the basic philosophical concepts of environmental protection and sozology. Acquisition of skills in the analysis of sustainable development aspects and sozotechnic methods.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W01	one has knowledge required to understand social, legal and other non-technical conditions of engineering activities and knowledge of their application in engineering practice	lectures	Kolokwium
K2A_W04	one is familiar with the principles of establishing and developing different forms of an individual enterprise, based on the use of knowledge from the specific areas of expertise and scientific disciplines typically applied in the field of transport	lectures	Kolokwium
K2A_W17	one has knowledge about the state of the art and the latest development trends in transport as well as its impact on the natural environment	lectures	Kolokwium
			Kolokwium
Skills: a student can			
K2A_U11	one can apply systemic approach considering non-technical aspects in engineering tasks	lectures	Kolokwium
Social competences: a student is prepared to			

K2A_K02	one is aware of the relevance and understands non-technical aspects and effects of engineering activities, including its environmental impact and the related responsibility for the decisions made	lectures	Kolokwium

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Lectures: Presentation of state of art of the ecophilosophy and sozology concepts. The object of study of sozology and ecophilosophy. Analysis of terminology in ecophilosophy: conception of sozology, sozotechnics, philosophy of environmental protection, philosophy of sustainable development. Concepts of ecophilosophy. Outline of the structure of ecophilosophy. The place of ecophilosophy in the system of philosophical sciences. Ecophilosophy and other philosophical disciplines. Philosophy of science about environmental protection. Main currents of ecophilosophy. Philosophical premises of ecology. The philosophical foundations of eco-development. The idea of sustainable development and its philosophical foundations. Development of the theory of ecophilosophy and sozology. The significant issue of the systematic sozology conception.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	0
Student's workload n*	0
The other**	0
Total hours:	**45**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 0
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 0
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Dr hab. inż. Dorota Burchart-Korol, prof. PŚ, dorota.burchart-korol@polsl.pl

7. Detailed description of teaching modes:

   detailed program content: Discussion of the subject of research into ecophilosophy and sozology. Terminology analysis in ecophilosophy: adventure philosophy, sozology, environmental philosophy, philosophy of sustainable development. Concepts of ecophilosophy. The idea of sustainable development

and its philosophical foundations. Development of the theory of ecophilosophy and sozology. Analysis of systemic sozology. Overview of aspects of sustainable development. Broadening knowledge on the risks of environmental pollution. Understanding new methods of assessing environmental impact. Educational methods used, including distance learning methods and techniques: lecture with multimedia presentation. Form and criteria of passing, including retake rules, as well as the conditions for admission to the exam: written colloquium: test with open questions. Organization of classes and rules for participation in classes, with an indication of whether the student's attendance is obligatory: the student's attendance at lectures is not mandatory.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   Test grade is the final grade of the lecture

9. Method and procedure for making up for
   student absences from classes: Attendance at lectures is optional, so it does not affect the credit for the course. Completed differences in study programs of persons moving from another field of study, from another university or resuming studies at the Silesian University of Technology: Complementing differences in study programs is in test form.

10. Prerequisites and additional requirements, taking into account the course sequence:

    general knowledge in the field of environmental protection

11. Recommended sources and teaching aids:
    Z. Piątek, Ekofilozofia, UJ, Kraków 2008. J.M. Dołęga, Ekofilozofia – nauka XXI wieku, Problemy Ekorozwoju 2006, vol. 1, nr 1. J.M. Dołęga, Sozologia systemowa – dyscyplina naukowa XXI wieku, Problemy Ekorozwoju 2006, vol. 1, nr 2. M. Terlecka (red.) Wybrane etyczno-filozoficzne aspekty ochrony środowiska, Armagraf, Krosno 2014. L. Pawłowski (red.), Filozoficzne, społeczne i ekonomiczne uwarunkowania zrównoważonego rozwoju, Lublin 2004, Seria Monografie KIŚ PAN, nr 26.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    D.Sc. in the field of environmental engineering. Specialization: ecological engineering. Scientific publications on the subject of the lecture

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: FOREIGN LANGUAGE
Course code: MK2e_3
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 0;
classes – 30;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W05	one has both general and specialist knowledge within transport in a foreign language, knowledge of grammar and lexical structures enabling one to understand and create various spoken and written texts, both formal and informal relating to exact as well as abstract subjects, including understanding a discussion concerning technical aspects of transport, advanced knowledge of general technical and specialist transport vocabulary; knowledge of grammatical and syntactic structures used in specialist texts		
Skills: a student can			
K2A_U04	one can acquire information from publications and other sources; one can integrate the retrieved pieces of information, interpret them, draw conclusions as well as formulate and exhaustively substantiate opinions, also in a foreign language		

K2A_U08	one understands the relevance of main themes conveyed in complex texts devoted both to specific and abstract subjects; one can fluently and spontaneously talk to a native speaker of a given foreign language in a manner not causing any tension to either party; one can formulate both oral and written opinions pertaining to a wide variety of topics in a transparent and comprehensible manner, explaining one's standpoint, providing arguments for and against; one can easily display, in both an oral and written form, knowledge acquired about the given subject delivered in the form of a lecture in a foreign language; one can search for information in various types of foreign language sources		
K2A_U09	one can determine the directions of continued learning and implement the self-learning process		
Social competences: a student is prepared to			
K2A_K06	one can think and act in a creative and entrepreneurial manner		

3. The content of study programme ensuring learning outcomes (according to the study programme):

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	
Student's workload 1*	
Student's workload 2*	
Student's workload n*	
The other**	
Total hours:	**0**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students:
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace:

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

7. Detailed description of teaching modes:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

9. Method and procedure for making up for

10. Prerequisites and additional requirements, taking into account the course sequence:

11. Recommended sources and teaching aids:

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: FOREIGN LANGUAGE
Course code: MK2e_3a
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 0;
classes – 30;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W05	one has both general and specialist knowledge within transport in a foreign language, knowledge of grammar and lexical structures enabling one to understand and create various spoken and written texts, both formal and informal relating to exact as well as abstract subjects, including understanding a discussion concerning technical aspects of transport, advanced knowledge of general technical and specialist transport vocabulary; knowledge of grammatical and syntactic structures used in specialist texts		
Skills: a student can			
K2A_U04	one can acquire information from publications and other sources; one can integrate the retrieved pieces of information, interpret them, draw conclusions as well as formulate and exhaustively substantiate opinions, also in a foreign language		

K2A_U08	one understands the relevance of main themes conveyed in complex texts devoted both to specific and abstract subjects; one can fluently and spontaneously talk to a native speaker of a given foreign language in a manner not causing any tension to either party; one can formulate both oral and written opinions pertaining to a wide variety of topics in a transparent and comprehensible manner, explaining one's standpoint, providing arguments for and against; one can easily display, in both an oral and written form, knowledge acquired about the given subject delivered in the form of a lecture in a foreign language; one can search for information in various types of foreign language sources		
K2A_U09	one can determine the directions of continued learning and implement the self-learning process		
Social competences: a student is prepared to			
K2A_K06	one can think and act in a creative and entrepreneurial manner		

3. The content of study programme ensuring learning outcomes (according to the study programme):

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	
Student's workload 1*	
Student's workload 2*	
Student's workload n*	
The other**	
Total hours:	**0**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students:
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace:

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

7. Detailed description of teaching modes:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

9. Method and procedure for making up for

10. Prerequisites and additional requirements, taking into account the course sequence:

11. Recommended sources and teaching aids:

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: SOCIAL COMMUNICATION
Course code: MK2e_4
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 30;
classes – 0;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 3
* – *leave the appropriate option*

1. Course objectives:

   knowledge handover in the topic of human communication and gaining new skills in the field of effective communication both in private and work life, teamwork, how to influence and manipulate conversation and time management.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W02	one has knowledge necessary to understand economic and other non-technical conditions of engineering activities and knowledge of their application in engineering practice	lecture	test
Skills: a student can			
K2A_U01	one can interpret and explain social phenomena and mutual relations between phenomena	lecture	test
Social competences: a student is prepared to			
K2A_K01	one understands the need for lifelong learning, can inspire others to learn and organise their learning process	lecture	test
K2A_K03	one can collaborate in a group of people, assuming different roles	lecture	test
K2A_K07	one is aware of the social role of a technical university graduate, and in	lecture	test

	particular, one understands the need to formulate and provide the society with information and opinions related to technical achievements and other aspects of engineer's work, among others by the means of mass media; one attempts to deliver such information and opinions in a generally comprehensive manner, substantiating various points of view		
	one can collaborate in a group of people, assuming different roles		

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Introduction to social communication. Company communication, horizontal and vertical communication. The methods and techniques of social impact, the ways of building a long term and positive interpersonal dialogue, nonverbal communication, active listening. Negotiation process. Basic techniques and tactics of negotiation. The communication impact on individual entrepreneurship development. The communication of individual entrepreneurship creation in the field of transportation. How to communicate in the critical situations. The customer communication, management styles. The levels of communication: interpersonal, group. The theory of conflict and how to overcame it, conflict management, human behavior in conflict situations. Company's image management, social competences, the styles of conflict resolution, how to ask questions, how to recognize persuasive, manipulative, propaganda message, advertisements, multimedia auto presentation.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	20
Student's workload 2*	10
Student's workload n*	15
The other**	
Total hours:	**75**
Number of ECTS credits allocated to a course	**3**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Dr Wioletta Ocieczek, wioletta.ocieczek@polsl.pl

7. Detailed description of teaching modes:
   Lectures: detailed program content: Social communication, verbal communication, non-verbal communication, the role of active listening. Interpersonal communication. Basic principles of self-presentation, communication during an interview. Communication in crisis situations. Work team, teamwork, diagnosis of team role. Agile and Scrum teams. Personality and ways of communication. Influence of temperament on communication. Individual differences. Methods and techniques of social influence. Social rules, the rule of contrast, reciprocity, authority, commitment and consistency, conformism, inaccessibility. Basic negotiation techniques. Time management, application of time management matrix. Teaching methods used, including distance learning methods and techniques: lecture with multimedia presentation, discussion. Form and criteria for passing, including retake rules, as well as conditions for taking the exam: obtaining a positive grade from the written test, preparing the report, two deadlines for resit. Organization of classes and rules of participation in classes, with an indication of whether student attendance is obligatory, optional presence

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   The final grade is determined on the basis of the final test after passing the time management report

9. Method and procedure for making up for
   Student's absence from classes, differences in study programs of persons moving from another field of study, from another university or resuming studies at the Silesian University of Technology, Determined individually with the student on the basis of the subject card, completed learning content,

10. Prerequisites and additional requirements, taking into account the course sequence:
    No entry requirements

11. Recommended sources and teaching aids:
    Sociology, Anthony Giddens, Philip W.Sutton, Polity Press, 2017

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    Education: Doctor of humanities Human Resources Management Study Business Management Marketing Study, Experience: Conducting training and consulting for companies in the field of social communication, self-presentation and human resource management.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: MODERN SYSTEMS FOR MAINTAINING MEANS OF TRANSPORT
Course code: MK2e_5
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 0;
projects - 15;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 3
* – *leave the appropriate option*

1. Course objectives:

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W10	one has extended knowledge of how modern transport functions and areas connected with it		
K2A_W15	one has theoretically grounded and detailed knowledge about the use of means of transport as well as their technical operation		
K2A_W22	One is familiar with typical engineering techniques in the field of learning course of study		
Skills: a student can			
K2A_U03	one can design a complex transport related device, system or process in compliance with the given specification including non-technical aspects, and implement such a project - at least partially - applying appropriate methods, techniques and tools, including adaptation of the existing tools or development of new ones for these purposes		
K2A_U16	one can design technical back-up elements, facilities and systems for transport and logistics infrastructure with the consideration of given utility and		

	economic criteria, using appropriate methods, techniques and tools		
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	
Student's workload 1*	
Student's workload 2*	
Student's workload n*	
The other**	
Total hours:	**0**
Number of ECTS credits allocated to a course	**3**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students:
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace:
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

7. Detailed description of teaching modes:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

9. Method and procedure for making up for

10. Prerequisites and additional requirements, taking into account the course sequence:

11. Recommended sources and teaching aids:

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: SIMULATION RESEARCH IN TECHNICAL
Course code: MK2e_6
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 0;
projects - 15;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   The general goal of education is to emphasize the role and importance of computer simulations in contemporary scientific research and in the design process; the universality of the use of simulation in many areas of technical, biological, economic and social knowledge; diversity available methods and simulation tools. The specific goal is to prepare for independent research simulations of transport problems.

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W07	one has extended and advanced knowledge in the field of mathematical methods and analyses applied to describe technical processes, transport systems and processes	Lecture, Project	Preparation of reports
K2A_W21	one has advanced knowledge related to the application of mathematical methods to describe transport related problems	Lecture	Test
Skills: a student can			
K2A_U10	one can plan and conduct experiments concerning simple research problems using diverse methods of analysis or simulation, interpret the obtained results and draw conclusions or formulate hypotheses	Project	Preparation of reports
K2A_U12	one can apply computer-aided design tools for simulation and the design of transport infrastructure and suprastructure elements	Project	Preparation of reports

K2A_U15	one can identify and verify transport elements, devices and processes	Project	Preparation of reports
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	30
Student's workload n*	
The other**	
Total hours:	**75**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 30/1
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Tomasz Matyja, dr hab. inż. Prof. PŚ, tomasz.matyja@polsl.pl

7. Detailed description of teaching modes:
   1. Lectures:
   2.
   3. - detailed program content:
   4.
   5. Basic concepts: system, model, simulation. Introduction to modeling methods and simulation of technical systems and processes. A brief introduction to the Matlab / Simulink environment. Modeling of systems using ordinary differential equations. Initial and boundary issues. Methods for solving differential equations using the symbolic calculation processor. Numerical integration of differential equations describing initial problems. Numerical integration of boundary problems. Partial differential

equations. Modeling of systems with distributed and focused parameters (continuous-discrete systems). Modeling of discrete problems and event-driven simulations.

6.

7. - educational methods used, including distance learning methods and techniques:

8.

9. Lectures in the form of presentations illustrated with examples of simulation models and calculation programs in the Matlab / Simulink environment. Lecture materials, including source codes of simulation programs and models available on the Remote Education Platform.

10.

11. - form and criteria for passing, including retake rules and conditions for admission to the exam:

12.

13. Colloquium from the lecture. Correction colloquium during consultations.

14.

15. - organization of classes and rules for participation in classes, with an indication of whether student attendance is obligatory:

16.

17. Attendance at lectures is not obligatory.

18.

19. Project (in sections).

20.

21. - detailed program content:

22.

23. Development of a mathematical model of a selected technical system or process related to transport, identification and selection of the range of parameter variability, computer simulation, interpretation of results and test report.

24.

25. - educational methods used, including distance learning methods and techniques:

26.

27. Materials necessary to complete the project, including instructions, source codes of sample programs and simulation models available on the Remote Education Platform.

28.

29. - form and criteria for passing, including retake rules and conditions for admission to the exam:

30.

31. Declaration of subject and assumptions of the project agreed on with the teacher (paper form). Project report together with program codes (electronic form sent to the Remote Education Platform). In exceptional cases, it can be handed over to the teacher in paper form and on CD.

32.

33. - organization of classes and rules of participation in classes, with an indication of whether student attendance is obligatory,

34.

Mandatory presence. Maximum two unexcused absences. The first three classes illustrating, on selected examples, the basic principles of developing models in the Matlab / Simulink and Scilab / Xcos environments. Another one devoted to consulting project topics and models developed independently by students (under the tutor's guidance)

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   The final grade is the grade obtained from the project. A necessary condition for passing the entire subject is a positive grade for the lecture test.

9. Method and procedure for making up for
   35. - the student's absence from classes:
   36.
   37. Two unexcused absences allowed during design classes. The student is obliged to consult the progress of the project during classes, and in the case of justified absences, at public consultations.
   38.
   39.
   40.
   - differences in

10. Prerequisites and additional requirements, taking into account the course sequence:
    Mathematics, mechanics, means of transport, in the first cycle studies. Applied mechanics in second-cycle studies (parallel subject).

11. Recommended sources and teaching aids:
    Basic literature: 1.Krajka. A. „Modelowanie i symulacje". Wyd. Uniwersytetu MCS, Seria Informatyczna, Lublin 2012.;2.Klempka R. ,Stankiewicz A. „Modelowanie i symulacje układów dynamicznych". Uczelniane Wyd. Nauk.-Dyd. AGH, Kraków, 2004.;3.Osowski S. "Modelowanie układów dynamicznych z zastosowaniem języka SIMULINK". Oficyna Wyd. Pol. Warszawskiej, Warszawa 1999.; Supplementary literature:1. Wolf Dieter Pietruszka. "MATLAB und Simulink in der Ingenieurpraxis: Modellbildung, Berechnung und Simulation (Auflage: 4)". Springer, 2014.;2. Matalb/Simulink users guide.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    Good knowledge of Matlab / Simulink environment and programming. Scientific achievements in the field of modeling and simulation of dynamic phenomena. 1. Tomasz Haniszewski, Tomasz Matyja: Analysis of cart-pendulum system with elastic rope for verification of rope deflection angle during a collision of the crane trolley with rubber buffer. Transport Problems 2018.

    2. Tomasz Matyja, Tadeusz Opasiak: Nieliniowy model dynamiczny sprzęgła oponowego z uwzględnieniem tłumienia z histerezą. WibroTech 2017.

    3. Bogusław Łazarz, Tomasz Matyja, Tadeusz Opasiak: Zmodyfikowany asymptotyczny model nieliniowego tłumienia z histerezą. WibroTech 2017.

    4. Tomasz Matyja: Badania symulacyjne wpływu wstępnego obciążenia na drgania układów wirujących. XLIII Diagnostyka maszyn, 2016.

    5. Tomasz Matyja: Simplified method of modelling the bearing supports in rotating systems. J. Vibroeng. 2016 vol. 18 no. 1, s. 93-102.

    6. Tomasz Matyja, Bogusław Łazarz: Selection of torsional vibration damper based on the results of simulation. J. Vibroeng. 2015 vol. 17 no. 8, s. 4069-4077.

    7. Tomasz Matyja, Bogusław Łazarz: Modeling the coupled flexural and torsional vibrations in rotating machines in transient states. J. Vibroeng. 2014 vol. 16 no. 4, s. 1911-1924.

    8. Tomasz Matyja. Simulink library project for modeling and simulation of dynamic phenomena in rotating power transmission systems. Transp. Probl. 2014 vol. 9 iss. 2, s. 101-110.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: METHODOLOGY OF SCIENTIFIC RESEARCH
Course code: MK2e_7
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 0
Semester: 0
Teaching modes and teaching hours:
lectures – 0;
classes – 0;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 0
* – *leave the appropriate option*

1. Course objectives:

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W14	one is familiar with basic methods, techniques and tools applied in the designing and analysis of transport systems		
Skills: a student can			
K2A_U10	one can plan and conduct experiments concerning simple research problems using diverse methods of analysis or simulation, interpret the obtained results and draw conclusions or formulate hypotheses		
K2A_U13	one can use suitable methods as well as instruments and workstations enabling measurements of basic quantities determining technical condition of elements of means of transport		
K2A_U22	on the basis of the assessment of applicability of methods, tools and new engineering achievements and applying new conceptual methods, one can solve complex or atypical engineering tasks,		

	including research tasks in the fields of transport or logistics		
Social competences: a student is prepared to			
K2A_K04	one can define the priority as well as identify and resolve dilemmas related to the performance of a task set by oneself and others		

3. The content of study programme ensuring learning outcomes (according to the study programme):

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	
Student's workload 1*	
Student's workload 2*	
Student's workload n*	
The other**	
Total hours:	**0**
Number of ECTS credits allocated to a course	**0**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students:
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace:
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

7. Detailed description of teaching modes:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

9. Method and procedure for making up for

10. Prerequisites and additional requirements, taking into account the course sequence:

11. Recommended sources and teaching aids:

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: MODELLING OF TRANSPORT PROCESSES
Course code: MK2e_8
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 30;
classes – 0;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   Modelling skill of transport systems and processes. Knowledge about prediction of traffic. Analysis skill of transport processes.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W21	one has advanced knowledge related to the application of mathematical methods to describe transport related problems	lecture	Wygłoszenie prezentacji
Skills: a student can			
K2A_U02	one can conduct preliminary economic analysis of the undertaken engineering activities and apply mathematical tools to analyse engineering problems	lecture	Wygłoszenie prezentacji
K2A_U07	one can prepare and deliver a concise presentation concerning individual transport related problems, also in a foreign language	lecture	Wygłoszenie prezentacji
K2A_U14	one can analyse and assess various transport systems and propose their suitable modifications and improvements	lecture	Wygłoszenie prezentacji
K2A_U20	while formulating and solving tasks including the design of transport facilities, systems and processes, one can integrate and systematise knowledge considering non-technical, environmental, economic and legal aspects	lecture	Wygłoszenie prezentacji

Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Lecture: Review of real transport processes. Modelling of transport systems (static, dynamic, stochastic, deterministic models). Models of transport system environment - dependences and demand of transport. Time delay models. Sustainable development and directions of transportation infrastructure and systems development and transportation policy. Alternative modes of transportation. Transportation accessibility. Queuing theory - basis queuing systems (Kendall classification., Little's formulas etc.). Forecasting rules of traffic flow. Simulation of transport processes.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	
Student's workload 2*	
Student's workload n*	15
The other**	
Total hours:	**45**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30_/_2
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 30_/_2
   - number of course hours and ECTS credits at the course developing practical skills - in the case of practical studies: 30_/_2
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30_/_2
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Grzegorz Sierpiński, PhD DSc Eng, prof. SUT, grzegorz.sierpinski@polsl.pl

7. Detailed description of teaching modes:
   1. 1) wykłady:
   2. - szczegółowe treści programowe:
   3. Lecture: Review of real transport processes. Modelling of transport systems (static, dynamic, stochastic, deterministic models). Models of transport system environment - dependences and demand of transport. Time delay models. Sustainable development and directions of transportation infrastructure and systems development and transportation policy. Alternative modes of transportation. Transportation accessibility. Queuing theory - basis queuing systems (Kendall classification., Little's formulas etc.). Forecasting rules of traffic flow. Simulation of transport processes.

4. - stosowane metody kształcenia, w tym metody i techniki kształcenia na odległość:
5. Lecture with multimedia and practical examples.
6. - forma i kryteria zaliczenia, w tym zasady zaliczeń poprawkowych, a także warunki dopuszczenia do egzaminu:
7. The condition of passing the lecture is obtaining a positive assessment of the presentation.
8. - organizacja zajęć oraz zasady udziału w zajęciach, ze wskazaniem czy obecność studenta na zajęciach jest obowiązkowa,
9. Classes are held in the form of a lecture.
10. 2) opis pozostałych form prowadzenia zajęć:

brak.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

The final grade in the subject (the only form of class is the lecture) is the grade obtained for the content of the prepared and delivered presentation in English.

9. Method and procedure for making up for
   11. - nieobecności studenta na zajęciach,
   12. - różnic w programach studiów osób przenoszących się z innego kierunku studiów, z innej uczelni albo wznawiających studia na Politechnice Śląskiej,

   As part of the program differences, participation in lecture classes is required.

10. Prerequisites and additional requirements, taking into account the course sequence:

transportation infrastructure, transportation systems and processes, basis of traffic engineering, optimization of transportation network, knowledge of a general of computer applications.

11. Recommended sources and teaching aids:

Juan de Dios Ortúzar, Luis G. Willumsen: Modelling transport. John Wiley & Sons, Ltd, West Sussex, United Kingdom 2011.

Daganzo C. F.: Fundamentals of transportation and traffic operations. Elsevier Science Ltd, Oxford 1997.

Gartner N., Messer C. J., Rathi A. K.: Traffic Flow Theory A State-of-the-Art Raport. Transportation Research Board, Washington 2001. Revised version of Special Report: Traffic Flow Theory, Washington 1975.

Adan I., Resing J.: Queuing theory. Eindhoven University of Technology, 2001.

Kleinrock L.: Queueing systems. Volume I: Theory. A Wiley-Interscience Publication. Canada 1975.

Kuwahara M., Horiguchi R., Yoshii T.: Standard verification process for traffic flow simulation model. Version 2, Traffic Simulation Committee, Japan Society of Traffic Engineers, 2002.

Sabra Z., Wallace Ch. E., Lin F.: Traffic analysis software tools. Transportation Research Board / National Research Council, Circular No E-CO14, September 2000.

European Platform on Mobility Management www.epomm.eu

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

Associate professor at the Faculty of Transport of the Silesian University of Technology (Department of Transport Systems and Traffic Engineering). Post-graduate studies in Organization Management. Author and co-author of more than 200 scientific papers and chapters of books. Scientific editor of several monographs. His professionals experience includes more then twenty contract works in the field of transportation. National manager of two projects under the ERANET program. In his scientific interests, he

combines the problems of road traffic engineering (including traffic analysis and forecasting, modeling of transport systems and optimization of transport networks) with shaping travel behaviors in cities. Chairman of the Organizing Committee of the cyclic Scientific and Technical Conference “Transport Systems. Theory and Practice“ (Department of Transport Systems and Traffic Engineering).

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: MODELLING OF TRANSPORT SYSTEMS
Course code: MK2e_9
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 0;
classes – 0;
laboratory - 15;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W13	one has knowledge in the field of transport and logistic systems as well as their development trends and technical assistance methods for their processes	laboratory	Opracowanie sprawozdań lub raportów
K2A_W19	one has knowledge required to understand economic and other non-technical conditions of engineering activities and principles of occupational health and safety applied in engineering work	laboratory	Opracowanie sprawozdań lub raportów
Skills: a student can			
K2A_U03	one can design a complex transport related device, system or process in compliance with the given specification including non-technical aspects, and implement such a project - at least partially - applying appropriate methods, techniques and tools, including adaptation of the existing tools or development of new ones for these purposes	laboratory	Opracowanie sprawozdań lub raportów
K2A_U05	one is capable of both individual and team work, and can communicate using selected techniques in different professional environments, also in a foreign language	laboratory	Opracowanie sprawozdań lub raportów

K2A_U19	one can conduct critical analysis and plan transport processes	laboratory	Opracowanie sprawozdań lub raportów
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   "Laboratory: modeling of displacement processes based on examples, Track Systems Assessment System (SOUT) including, among others, analysis of the use of track nodes, determining the optimal traffic intensity by estimating the traffic flow function, dependence matrices, analysis of the railway network using SOUT, traffic testing inner city aided by a computer program, basic rules for choosing a detour path in traffic, a method for estimating the intrinsic traffic distribution on a network of intersections, taking into account the transfer of vehicle queues in the time loss model, modeling of the parking process in cities. "

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	15
Student's workload 1*	
Student's workload 2*	
Student's workload n*	
The other**	0
Total hours:	**15**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 15_/_2
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 15_/_2
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 15_/_2
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 15_/_2
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Grzegorz Sierpiński, PhD DSc Eng, prof. SUT, grzegorz.sierpinski@polsl.pl

7. Detailed description of teaching modes:
   1. "Laboratory: modeling of displacement processes based on examples, Track Systems Assessment System (SOUT), including discussing the determination of optimal traffic intensity by estimating traffic flow functions, dependency matrices, analysis of the railway network using SOUT; identification of traffic scenarios at the inlet of the intersection with traffic lights , calculation procedure of average time losses in subsequent sub-periods of an hour, taking into account the move of the queue to the next sub-period; modeling of the parking process in cities, including determining the characteristics of the parking

process in a selected area, the variability of the phenomenon over time and in relation to the duration of this process.

2. The condition of passing the laboratory is to obtain a positive grade from each of the reports prepared.
3. Participation in laboratory classes is mandatory.

"

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   The final grade in the subject (the only form of conducting classes is the laboratory) is the arithmetic average of the grades obtained from the reports.

9. Method and procedure for making up for
   4. The absence requires doing the classes during the time appointed by the teacher.

   As part of the program differences, participation in laboratory classes is required.

10. Prerequisites and additional requirements, taking into account the course sequence:
    transport infrastructure, transport systems and processes, basics of traffic engineering, optimization of transport networks, ability to use IT engineering programs

11. Recommended sources and teaching aids:
    Gaca S., Suchorzewski W., Tracz M.: Inżynieria ruchu drogowego. Teoria i praktyka. WKiŁ Warszawa 2008.

    Metoda obliczania przepustowości skrzyżowań z sygnalizacją świetlną. GDDKiA, Warszawa 2004, (metodologia

    aktualnie zalecana do stosowania w Polsce).

    Wesołowski J.: Miasto w ruchu. Dobre praktyki w organizowaniu transportu miejskiego. Instytut Spraw

    Obywatelskich, Łódź 2008.

    Szymczak M.: Logistyka miejska. Wyd. Akademii Ekonomicznej w Poznaniu, Poznań 2008.

    Szołtysek J.: Podstawy logistyki miejskiej. Wyd. Akademii Ekonomicznej w Katowicach, Katowice 2007.

    Tundys B.: Logistyka miejska. Koncepcje. Systemy. Rozwiązania. Difin, Warszawa 2008.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    Associate professor at the Faculty of Transport of the Silesian University of Technology (Department of Transport Systems and Traffic Engineering). Post-graduate studies in Organization Management. Author and co-author of more than 200 scientific papers and chapters of books. Scientific editor of several monographs. His professionals experience includes more then twenty contract works in the field of transportation. National manager of two projects under the ERANET program. In his scientific interests, he combines the problems of road traffic engineering (including traffic analysis and forecasting, modeling of transport systems and optimization of transport networks) with shaping travel behaviors in cities. Chairman of the Organizing Committee of the cyclic Scientific and Technical Conference "Transport Systems. Theory and Practice" (Department of Transport Systems and Traffic Engineering).

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: CONTROL AND MANAGEMENT IN TRANSPORT SYSTEMS
Course code: MK2e_10
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 0;
projects - 30;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 4
* – *leave the appropriate option*

1. Course objectives:

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W07	one has extended and advanced knowledge in the field of mathematical methods and analyses applied to describe technical processes, transport systems and processes	Lecture/project	kolokwium
K2A_W12	one has knowledge related to transport process management and modelling considering social, economic and legal aspects	Lecture/project	kolokwium
K2A_W13	one has knowledge in the field of transport and logistic systems as well as their development trends and technical assistance methods for their processes	Lecture/project	kolokwium
K2A_W16	one has knowledge in the field of control and management in transport, including quality engineering	Lecture/project	kolokwium
Skills: a student can			
K2A_U20	while formulating and solving tasks including the design of transport facilities, systems and processes, one can integrate and systematise knowledge considering non-technical, environmental, economic and legal aspects	Lecture/project	kolokwium

Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Lecture: management, supervision and control of transport systems, types of control of transport processes, control functions, control and management of transport demand, mobility plans and programs, traffic control and management in transport as an element of control in large systems, road and rail traffic control, aviation and maritime - common features and differences, methods and tools in the control process, tasks and methods for solving control problems, sustainable transport development, mobility and comodality in transport systems, elements of architecture and services of control and management systems, ITS systems as a comprehensive control and management in transport systems, analysis of ITS systems implemented in the country and in the world - architecture and services. Project: analysis and assessment of the city and agglomeration communication system along with identification of traffic control and management activities (implemented and planned), demand management - learning the principles and tools of mobility management (using knowledge bases and expert systems available on the EPOMM platform, for example, mobility management plans for characteristic facilities (university, shopping and service center, workplace) and user groups (employed at the facility and visiting the facility), preparation of the concept of ITS system architecture for the selected city/urban agglomeration.
4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	45
Student's workload 1*	15
Student's workload 2*	20
Student's workload n*	25
The other**	
Total hours:	**105**
Number of ECTS credits allocated to a course	**4**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 45
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 45
   - number of course hours and ECTS credits at the course developing practical skills - in the case of practical studies: 30
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 45
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Grzegorz Karoń, dr hab. inż., prof. uczelni, grzegorz.karon@polsl.pl

7. Detailed description of teaching modes:

1) lectures: - detailed program content: management, supervision and control of transport systems, types of control of transport processes, control functions, control and management of transport demand, mobility plans and programs, traffic control and management in transport as an element of control in large systems, road and rail traffic control, aviation and maritime - common features and differences, methods and tools in the control process, tasks and methods for solving control problems, sustainable transport development, mobility and comodality in transport systems, elements of architecture and services of control and management systems, ITS systems as a comprehensive control and management in transport systems, analysis of ITS systems implemented in the country and in the world - architecture and services. - teaching methods used, including distance learning methods and techniques: lecture using multimedia techniques, - form and criteria for passing, including retake tests, and conditions for admission to the exam: written test, 2 retake dates, - organization of classes and rules for participation in classes, with an indication whether the student's presence in classes is compulsory: lecture - 15x2 hours a week - optional attendance, 2) description of other forms of conducting classes: project - detailed program content: analysis and assessment of the city and agglomeration communication system along with identification of traffic control and management activities (implemented and planned), demand management - learning the principles and tools of mobility management (using knowledge bases and expert systems available on the EPOMM platform, for example, mobility management plans for characteristic facilities (university, shopping and service center, workplace) and user groups (employed at the facility and visiting the facility), preparation of the concept of ITS system architecture for the selected city/urban agglomeration. - teaching methods used, including distance learning methods and techniques: computer work, use of multimedia techniques, - form and criteria for passing, including retake tests, as well as conditions for admission to the exam: preparation of the report, - organization of classes and rules for participation in class, with an indication of whether the student's attendance is obligatory: laboratory - 15x1 hour weekly - obligatory attendance.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   Final grade - average grade from kolowkium and reports

9. Method and procedure for making up for
   - student's absence from classes: performing tasks from the instructions to the laboratory: differences in the study programs of persons moving from another field of study, from another university or resuming studies at the Silesian University of Technology: passing the learning outcomes on the basis of the test and tasks from the laboratory instructions.

10. Prerequisites and additional requirements, taking into account the course sequence:
    transport systems and processes, transport infrastructure, basics of traffic engineering: knowledge of issues related to the description and functioning of transport systems

11. Recommended sources and teaching aids:
    1. Karoń G.: Kształtowanie ruchu w miejskich sieciach transportowych z wykorzystaniem inżynierii systemów. Wydawnictwo Politechniki Śląskiej, Gliwice 2019. 2. Gaca S., Suchorzewski W., Tracz M.: Inzynieria Ruchu Drogowego WKŁ 2008, 3. Leśko M.: Sterowanie ruchem drogowym. Sterowniki i systemy sterowania i nadzoru ruchu. Wyd. Politechniki Śląskiej, 2000, 4. Malarski. M: Inżynieria ruchu lotniczego. Oficyna Wydawnicza Politechniki Warszawskiej. 2006, 5. Adamski A.: Inteligentne systemy transportowe: sterowanie, nadzór i zarządzanie. AGH, Uczelniane Wydawnictwa Naukowo- Dydaktyczne, Kraków 2003, 6. Platforma EPOMM z materiałami źródłowymi, m.in. podręczniki zarządzania mobilnością, 7. Rydzkowski W., Wojewódzka A., Król K.: Transport. Wydawnictwo Naukowe PWN, Warszawa 2005, 8. Januszewski J.: Systemy satelitarne GPS Galileo i inne. Wydawnictwo Naukowe PWN, Warszawa 2006, 9. Regional ITS Architecture Guidance. FHWA. 2006; (wersja elektroniczna), 10. Systems Engineering for ITS. An Introduction for Transportation Professionals. FHWA 2007.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

    1. Author and co-author of nearly 200 scientific publications, including the author's monograph covering program content of the subject. 2. Member of editorial committees of foreign and domestic scientific journals as well as technology clusters and associations in the field of transport systems and transport telematics. 3. Co-author of projects and an expert in local government units at the city, agglomeration, metropolis, voivodship, subregion level in the field of: research and measurement of traffic, functional analyzes as well as concepts for the construction and development of transport systems, urban mobility and intelligent transport systems. 4. Completed courses and trainings covering ITS architecture issues (CUPT certificate - Center for EU Transport Projects), telematics, management, organization and road safety.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: THEORY OF RELIABILITY AND SAFETY
Course code: MK2e_11
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 30;
classes – 0;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   gain basic skills and competence in reliability analysis of technical systems
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W06	one has advanced knowledge about the principles of conducting physical measurements and processing their results, measurement uncertainties and methods of their determination and presentation	lecture	test
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport	lecture	test
Skills: a student can			
K2A_U21	one applies principles of occupational health and safety in transport	lecture	test
K2A_U23	one is capable of conducting an analysis in the field of a technical system reliability and safety	lecture	test
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Definition and discussion of basic terms used for reliability evaluation. Basic life time distribution models used for non-repairable populations. Basic repair rate models used for repairable systems. Reliability block diagrams and fault trees. Complex systems. Redundancy. Analysis of repairable systems by Markov methods. System failure analysis based on FMECA. Safety and critical systems. Analysis of safety using HAZOP. Class: Analysis of complex systems reliability using reliability block diagrams. FTA – case studies. Determination of life time distribution models of non repairable populations. FMECA and HAZOP - case studies.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	15
Student's workload n*	
The other**	
Total hours:	**60**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30/1
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Wiesław Pamuła dr hab. inż. wieslaw.pamula@polsl.pl

7. Detailed description of teaching modes:
   1. 1) wykłady:
   2. - szczegółowe treści programowe:
   3. Basic reliability terms, reliability data collecting and censoring, modelling reliability, life data analysis, probability density functions, PDF parameter estimation, reliability data collection, confidence bounds, structural reliability analysis, Reliability Block Diagrams, Fault Tree Analysis, Failure Mode Effects Analysis, HAZOP, Markov processes, repairable systems, Poisson distribution, maintenance terms, Bayesian methodology for reliability analysis, RAMS, Safety Management Systems
   4. - stosowane metody kształcenia, w tym metody i techniki kształcenia na odległość:

   prezentacja multimedialna, dodatkowe materiały i treść prezentacji dostępne na Platformie Zdalnej Edukacji Wydziału Transportu na kursie „Theory of Reliability and Safety", konsultacje,

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   Written test with open questions. End mark is the mean of answer marks.

9. Method and procedure for making up for
   extra written test

10. Prerequisites and additional requirements, taking into account the course sequence:
    mathematics, statistics

11. Recommended sources and teaching aids:
    R. F. Stapelberg: Handbook of Reliability, Availability, Maintainability and Safety in Engineering Design, Springer 2016

    W. Pamuła: Niezawodność i bezpieczeństwo. Wybór zagadnień. Wydawnictwo Pol.Śl. Gliwice 2011.

    B. Bertsche: Reliability in Automotive and Mechanical Engineering Determination of Component and System

    Reliability, Series: VDI-Buch Springer Verlag 2008.

    Standard PN-EN 60812:2006 FMECA.

    Standard PN-EN 61882 HAZOP

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    Author of text book: W. Pamuła: Niezawodność i bezpieczeństwo. Wybór zagadnień. Wydawnictwo Pol. Śl. Gliwice 2011. Author of study reports in the field of reliability analysis.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: RELIABILITY OF ELEMENTS AND SYSTEMS
Course code: MK2e_12
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 0;
classes – 15;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport	exercises	test
K2A_W22	One is familiar with typical engineering techniques in the field of learning course of study	exercises	test
Skills: a student can			
K2A_U04	one can acquire information from publications and other sources; one can integrate the retrieved pieces of information, interpret them, draw conclusions as well as formulate and exhaustively substantiate opinions, also in a foreign language	exercises	test
K2A_U17	one can make the use of standards, catalogues, technical documentation and other sources in order to perform various engineering tasks, including materials in foreign languages	exercises	test
K2A_U23	one is capable of conducting an analysis in the field of a technical system reliability and safety	exercises	Preparation of reports
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	15
Student's workload 1*	
Student's workload 2*	15
Student's workload n*	15
The other**	
Total hours:	**45**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 15/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 15/1
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Wiesław Pamuła, dr hab. inż. wieslaw.pamula@polsl.pl

7. Detailed description of teaching modes:
   1. 1) blackboard exercises:
   2. detailed program content:
   3. determination of parameters of reliability models, construction of block diagrams of complex technical systems, principles of preparation of the FMECA report, testing of statistical hypotheses related to determining the reliability function, calculation of parameters of repairable systems models.
   4. teaching methods used, including distance learning methods and techniques:
   5. additional materials and tasks available on the Remote Education Platform of the Faculty of Transport during the course "Reliability of components and systems", consultations,
   6. ☒ organization of classes and rules of participation in classes, with an indication of whether student attendance is obligatory,
   7. in accordance with the study regulations
   8. 1) lectures:

9. ☒ detailed program content:
10. determination of parameters of reliability models, construction of block diagrams of complex technical systems, principles of preparation of the FMECA report, testing of statistical hypotheses related to determining the reliability function, calculation of parameters of repairable systems models.
11. Kształcenia teaching methods used, including distance learning methods and techniques:
12. additional materials and tasks available on the Remote Education Platform of the Faculty of Transport during the course "Reliability of components and systems", consultations,
13. ☒ form and criteria for passing, including retake rules, as well as conditions for taking the exam:
14. final written test, FMECA report on a selected topic,
15. ☒ organization of classes and rules of participation in classes, with an indication of whether student attendance is obligatory,

in accordance with the study regulations

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   A written test is carried out consisting of tasks requiring the calculation of parameters of reliability models and the participant prepares an FMECA report on a selected topic from those provided on the Remote Education Platform. The final grade is set a

9. Method and procedure for making up for
   correction test, report improvement according to the teacher's remarks

10. Prerequisites and additional requirements, taking into account the course sequence:
    Knowledge in mathematics and statistics.

11. Recommended sources and teaching aids:
    R. F. Stapelberg: Handbook of Reliability, Availability, Maintainability and Safety in Engineering Design, Springer 2016

    W. Pamuła: Niezawodność i bezpieczeństwo. Wybór zagadnień. Wydawnictwo Pol.Śl. Gliwice 2011.

    B. Bertsche: Reliability in Automotive and Mechanical Engineering Determination of Component and System

    Reliability, Series: VDI-Buch Springer Verlag 2008.

    Norma PN-EN 60812:2006 FMECA.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    Author of text book: W. Pamuła: Niezawodność i bezpieczeństwo. Wybór zagadnień. Wydawnictwo Pol. Śl. Gliwice 2011. Author of study reports in the field of reliability analysis.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: INTERDISCIPLINARY GROUP PROJECT
Course code: MK2e_13
Classification of a course group: Common courses
Course type: core
obligatory
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): -
Year of study: 1
Semester: 1
Teaching modes and teaching hours:
lectures – 0;
classes – 30;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 1
* – *leave the appropriate option*

1. Course objectives:

   ability to work in a team to solve or develop a scientific problem in the field of current knowledge in the field of transport.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W03	one has basic knowledge related to management, including quality management and pursuing of a business activity	exercises	Opracowanie sprawozdań lub raportów
K2A_W20	one has knowledge in the field of resource management and protection of intellectual property rights, copyrights and patent regulations	exercises	Opracowanie sprawozdań lub raportów
Skills: a student can			
K2A_U06	one can develop documentation related to the performance of one's own studies and prepare a scientific text discussing the relevant outcomes, also in a foreign language	exercises	Opracowanie sprawozdań lub raportów
K2A_U18	one applies databases and Internet-based sources to perform engineering tasks	exercises	Opracowanie sprawozdań lub raportów
Social competences: a student is prepared to			
K2A_K05	one can identify and resolve dilemmas involved in the performance of a specific profession	exercises	Opracowanie sprawozdań lub raportów

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Exercises: formulation of a scientific problem of current importance in the field of transport, methods of interdisciplinary team selection, methods of planning and organizing team work, use of worldwide publication and patent databases, development of coherent research documentation (including justification of topic selection, current knowledge, description of research methods, preparation of results, formulation of conclusions).

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	10
Student's workload 2*	
Student's workload n*	0
The other**	0
Total hours:	**40**
Number of ECTS credits allocated to a course	**1**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 30
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 30
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Dr hab. inż. Dorota Burchart-Korol, prof. PŚ, dorota.burchart-korol@polsl.pl

7. Detailed description of teaching modes:

   1.

   detailed program content: Selection of thematic areas from transport to develop and write publications. Division of the group into teams. Magazine selection - review of magazines, editorial guidelines. Division of work in teams. Analysis of individual parts of the publication: abstract, keywords, literature review on the analyzed topic - Polish and foreign magazines, methodology of analysis, results, discussion of results, conclusions, literature. Substantive preparation of the publication (in Polish or English - in accordance with the guidelines of the journals). Formatting publications in accordance with the guidelines of the magazine's editors used learning methods, including methods and techniques of distance learning: classes are in the form of consultation with teams. form and criteria for passing, including retake rules, as well as the conditions for admission to the exam: project preparation - the project is publication. Organization of

classes and rules for participation in classes, with an indication of whether the student's presence in classes is compulsory: the student's presence in classes is compulsory in accordance with the study regulations.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   The final grade is determined on the basis of the evaluation of the publication prepared by students and the assessment of teamwork

9. Method and procedure for making up for
   Pursuant to the study regulations, students are required to excuse their absence no later than in the next class. In the case of three unexcused absences of a student in class, the lecturer informs the dean who will take a position on the matter. Making up for absence is only possible within the time limit set by the lecturer. The condition of passing the subject in case of arrears caused by differences in study programs is the preparation of the publication.

10. Prerequisites and additional requirements, taking into account the course sequence:
    general knowledge in the field of transport

11. Recommended sources and teaching aids:
    Literature consistent in the developed scientific issue. . A. Karbownik.:Rola i miejsce zarządzania projektami w przedsiębiorstwie, Wydawnictwo: Lubelskie Centrum Marketingu Sp. z. o. o. Praca zbiorowa pod red. W. Sitko, Lublin 2004. J. P. Lewis: Fundamentals of Project Management. AMACOM Div American Mgmt Assn, 2007; T. Kendrick: The Project Management Tool Kit. Amacom, 2014, ISBN: 9780814433454

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    Professional experience in managing and implementing many national and international scientific and research projects. Professional experience in managing a research team. Experience in developing many scientific publications.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: DEGRADATION AND DECOHESION OF MATERALS
Course code: MK2e_14
Classification of a course group: Common courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 15;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   The aim of the course is to familiarize students with mechanisms of degradadion of engineering materials and prevention methods to reduce the degradation of materials. Preparing students to carring out investigations for recognising causes of failure. Acquire the skill to use English terminology related to degradadion of materials.

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W08	one has extended and advanced knowledge in the field of analysis of physical phenomena and solutions of technical problems with the application of the laws of physics in the construction, operation and maintenance of means of transport	lecture	test
K2A_W09	one has knowledge in the field of materials science and laws of mechanics as well as their application in transport	laboratory	report
K2A_W18	one has well-organised and theoretically grounded knowledge in the field of applied mechanics	lecture	test
			test
Skills: a student can			
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Degradation and fracture, ductile and brittle cracking, crack initiation and propagation , fatigue, abrasive wear, erosion and cavitation, creep, classification of corrosion, hot corrosion, environmentally assisted cracking (stress corrosion cracking, hydrogen embrittlement and cracking). Laboratory: Characterization of ductile, brittle and fatigue fracture surfaces appearance with the use of: visual observations, light microscope, and scanning electron microscope (SEM). Determination of ductile to brittle transition temperature for steel. Abrasion wear measurement of hard and soft materials (pin-ondisc/plate tests). Observations of electrochemical corrosion damages in metals and alloys. Evaluation of scale after hot corrosion with SEM/EDS (Energy-Dispersive X-Ray Spectroscopy). Stress corrosion cracking of stainless steels. Hydrogen embrittlement and cracking of high-strength steels.
4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	10
Student's workload 2*	10
Student's workload n*	10
The other**	
Total hours:	**60**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30, 2 pkt ECTS
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 30, 2 pkt ECTS
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Janusz Ćwiek, dr hab. inż., prof. PŚ, janusz.cwiek@polsl.pl

7. Detailed description of teaching modes:
   Lectures:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   Final grade - average grade from tests and reports

9. Method and procedure for making up for

The absence requires doing the classes during the time appointed by the teacher. As part of the program differences, participation in laboratory classes is required.

10. Prerequisites and additional requirements, taking into account the course sequence:

Materials Science and Engineering, Applied Mechanics

11. Recommended sources and teaching aids:

M. F. Ashby and D. R. H. Jones, Engineering Materials Part 1, An introduction to Their Properties and Applications, Butterworth-Heinemann, Woburn, UK, 1996.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

The teacher has 30 years of experience in teaching. Has education in the field of mechanics, construction and operation of machines as well as materials engineering. Has experience in conducting scientific and research works for industry. He is the author of over 100 scientific publications.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: DIPLOMA SEMINAR
Course code: MK2e_15
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 2
Semester: 3
Teaching modes and teaching hours:
lectures – 0;
classes – 0;
laboratory - 0;
projects - 0;
seminars - 30.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   student will know how to make a references research and how to make a synthesis of examined material, student become acquainted with principles of planning and conducting of examination as well as of an analyze of achieved results, student become acquainted with principles of master thesis writing and presenting, student is prepared for the master examination,

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W20	one has knowledge in the field of resource management and protection of intellectual property rights, copyrights and patent regulations	seminar	giving a presentation
Skills: a student can			
K2A_U04	one can acquire information from publications and other sources; one can integrate the retrieved pieces of information, interpret them, draw conclusions as well as formulate and exhaustively substantiate opinions, also in a foreign language	seminar	giving a presentation
K2A_U06	one can develop documentation related to the performance of one's own studies and prepare a scientific text discussing the relevant outcomes, also in a foreign language	seminar	giving a presentation
K2A_U07	one can prepare and deliver a concise presentation concerning individual	seminar	giving a presentation

	transport related problems, also in a foreign language		
K2A_U09	one can determine the directions of continued learning and implement the self-learning process	seminar	giving a presentation
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   - how to choose references (2-3 leading domestic centers, 2-3 foreign centers), synthesis of knowledge (what is not complete, what is wrong/non current), thesis resulting from the analyze; - scientific methods of research; - which plans are applicable (static, dynamic), choose of plan, determination of influencing steering and resulting parameters, depend variables, constants, physical, technical and economical borders of experiment parameters; number of repetitions, measuring errors, scatter of result; - ways to presentation of results (equations, graphs, diagrams); - interpretation of results; - master thesis, dividing (chapter, subchapter), how to make a citation, figures preparing using software (Pain Shop Pro), useful functions in text editor(MS Word), data analyze, cause-result dependences, discussion of results, conclusions, summarizing; - examinations problems defined by Faculty of Transport for course; - preparing of presentation for diploma examination;
4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	120
Student's workload 2*	
Student's workload n*	
The other**	
Total hours:	**150**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 30/1
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Faculty staff with at least postdoctoral degree

7. Detailed description of teaching modes:

Degradation and fracture, ductile and brittle cracking, crack initiation and propagation , fatigue, abrasive wear, erosion and cavitation, creep, classification of corrosion, hot corrosion, environmentally assisted cracking (stress corrosion cracking, hydrogen embrittlement and cracking).

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   The final grade results from the degree of coverage of learning outcomes verified on the basis of prepared presentations and participation in discussions

9. Method and procedure for making up for
   The manner and manner of completing the backlog is determined directly with the seminar teacher

10. Prerequisites and additional requirements, taking into account the course sequence:
    subjects by study program

11. Recommended sources and teaching aids:
    2. W. D. Callister, Jr, Materials Science and Engineering – An introduction, seventh edition, John Wiley & Sons, Inc., New York, 2007.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    The seminar's staff are employees of the faculty with at least postdoctoral degree who have significant experience in conducting diploma theses and significant scientific achievements.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: DIPLOMA THESIS
Course code: MK2e_16
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 0
Semester: 0
Teaching modes and teaching hours:
lectures – 0;
classes – 0;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 10
* – *leave the appropriate option*

1. Course objectives:

   using knowledge and skills to independently solve a task in the field transport
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
Skills: a student can			
K2A_U10	one can plan and conduct experiments concerning simple research problems using diverse methods of analysis or simulation, interpret the obtained results and draw conclusions or formulate hypotheses	Thesis	Defending the thesis
Social competences: a student is prepared to			
K2A_K04	one can define the priority as well as identify and resolve dilemmas related to the performance of a task set by oneself and others	Thesis	Defending the thesis

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Master's thesis is an independent study made by a student. This study is an application of knowledge acquired by the student throughout the entire period of study to solve various tasks in the field of transport. Topics of work are selected individually for each student.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	0
Student's workload 1*	450
Student's workload 2*	
Student's workload n*	
The other**	
Total hours:	**450**
Number of ECTS credits allocated to a course	**10**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 0/0
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 0/0
   - number of course hours and ECTS credits at the course developing practical skills - in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 0
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Faculty staff with at least postdoctoral degree

7. Detailed description of teaching modes:
   Laboratory:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   The final grade results from the degree of coverage of learning outcomes verified on the basis of the prepared thesis

9. Method and procedure for making up for
   The manner and mode of completing the backlog is determined directly with the thesis supervisor

10. Prerequisites and additional requirements, taking into account the course sequence:
    subjects by study program

11. Recommended sources and teaching aids:

3. R. W. Hertzberg, Deformation and Fracture Mechanics of Engineering Materials, Fourth Edition, Wiley, New York, 1996.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

The promoters of diploma theses are employees of the faculty with at least doctoral degree who have significant experience in conducting diploma theses.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: HUMAN FACTOR IN TRANSPORT
Course code: MK2e_17
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 2
Semester: 3
Teaching modes and teaching hours:
lectures – 15;
classes – 15;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 3
* – *leave the appropriate option*

1. Course objectives:

   The aim of the course is to present the basics of human functioning as an reliable element in the structure of the transport system. The aim of the course is to present the possibility of carrying out the Human Factor reliability analysis and presentation of factors influencing on human functioning.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W19	one has knowledge required to understand economic and other non-technical conditions of engineering activities and principles of occupational health and safety applied in engineering work	lecture	Egzamin
Skills: a student can			
Social competences: a student is prepared to			
K2A_K01	one understands the need for lifelong learning, can inspire others to learn and organise their learning process	lecture	Egzamin
K2A_K03	one can collaborate in a group of people, assuming different roles	Classes	Kolokwium
K2A_K07	one is aware of the social role of a technical university graduate, and in particular, one understands the need to formulate and provide the society with	Classes	Kolokwium

	information and opinions related to technical achievements and other aspects of engineer's work, among others by the means of mass media; one attempts to deliver such information and opinions in a generally comprehensive manner, substantiating various points of view		
	one can collaborate in a group of people, assuming different roles		

3. The content of study programme ensuring learning outcomes (according to the study programme):

   - Human - Possibilities and Limitations - The influence of HF on reliability and safety in transport; - Factors influencing human functioning in the transport system; - Methods of human factor analysis; - Human factor and accidents in transport; - Identification of stimuli generated in transport and having a significant impact on the human factor; - An example of quantitative and qualitative analysis of the human factor. Classes (practical work): - Analysis of the human factor on the example of the selected disaster (accident) in transport; - Identification of factors affecting the human factor on a selected example of a workstation in transport; - Exemplary implementation of human factor analysis on a selected example of a workplace in transport.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	15
Student's workload n*	
The other**	
Total hours:	**60**
Number of ECTS credits allocated to a course	**3**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 15/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 15/1
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Adam Mańka, dr inż., adam.manka@polsl.pl

7. Detailed description of teaching modes:

   Characterization of ductile, brittle and fatigue fracture surfaces appearance with the use of: visual observations, light microscope, and scanning electron microscope (SEM). Determination of ductile to brittle transition temperature for steel. Abrasion wear measurement of hard and soft materials (pin-on-disc/plate

tests). Observations of electrochemical corrosion damages in metals and alloys. Evaluation of scale after hot corrosion with SEM/EDS (Energy-Dispersive X-Ray Spectroscopy). Stress corrosion cracking of stainless steels. Hydrogen embrittlement and cracking of high-strength steels.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   Arithmetic average of individual forms of classes.

9. Method and procedure for making up for
   In accordance with the study regulations of the Silesian University of Technology. It is possible to do laboratory / exercise classes at the last date of classes or during consultations.

10. Prerequisites and additional requirements, taking into account the course sequence:
    Fundamental knowledge of safety management and risk analysis, the basic of mathematics

11. Recommended sources and teaching aids:
    4. T. H. Courtney, Mechanical Behavior of Materials, Second Edition, McGrawHill, New York, 2000.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    The teacher has many years of experience in teaching. Has education in the field of transport and construction as well as machine operation. Has many years of research experience resulting from participation in over 100 scientific and research works carried out for Polish and foreign industry. He is the author of many research, measuring and teaching positions. He participates in many research projects financed from the National Center for Research and Development, KBN, FP5-FP7 and others. Has experience in providing opinions for the needs of judicial authorities in the field of construction and operation of rail vehicles and their cooperation with elements of the railway infrastructure. He is an expert of the National Center for Research and Development in the field of appraisal of applications and evaluation of the correct implementation of research projects related to transport. The lecturer conducts trainings for industry in the subject matter of the subject. Is the lead auditor according to ISO 9001 and internal IRIS veg, SMS and MMS. He is the co-author of the patent: "A device for measuring the pressure of brake pad insertion especially on a railway wheel" Patent. Poland, no. 225 237. Int.Cl. G01L 5/28. Silesian University of Technology, Application. No. 403 293 of 25/03/2013. Publ. 31/03/2017, 6 pp. He is the author of thematic publications, e.g .:

    1. Adam Mańka, Andrzej Hełka, Janusz Ćwiek: Influence of copper content on pantograph contact strip material on maximum temperature of railroad wire. -SC. J. Sil. Univ. Technol., Ser. Transp. 2020 vol. 106, pp. 97-105, bibliography 13 item

    2. Adam Mańka, M. Sitarz: Effects of a thermal load on the wheel / brake-block subsystem The thermal conicity of railway wheels, Proc. Inst. Down. Eng., F J. Rail Rapid Transit 2016 vol. 230 no. 1, pp. 193-205;

    3. Janusz Ćwiek, Mateusz Błach, Stanisław Dacy, Jarosław Jakubczyk, Wojciech Jarczyk, Adam Mańka, Mateusz Oleksik: IoT - Internet of Things as a tool for measuring comfort and ensuring safety in public transport. -Komun. Publiczna 2018 No. 3, pp. 23-29, bibliogr. 16 item 4. Adam Mańka: Transport problems 2018. X International scientific conference, 27.06-29.06.2018, Katowice, Wisła. VII International symposium of young researchers, 25.06-26.06.2018, Katowice. Proceedings.

    5. Andrzej Hełka, Adam Mańka: Operation of current collectors equipped with carbon contact strips - problems, measurements, remarks. -PR. Sciences. Warsaw, Transp. 2017, pp. 116, pp. 83-90, bibliography 15 item

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: INTEGRATED SAFETY MANAGEMENT SYSTEM
Course code: MK2e_18
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 2
Semester: 3
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 0;
projects - 15;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 3
* – *leave the appropriate option*

1. Course objectives:

knowledge of the functioning of an integrated safety management system in transport enterprises

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W01	one has knowledge required to understand social, legal and other non-technical conditions of engineering activities and knowledge of their application in engineering practice	lecture	Kolokwium
K2A_W17	one has knowledge about the state of the art and the latest development trends in transport as well as its impact on the natural environment	lecture	Kolokwium
Skills: a student can			
K2A_U02	one can conduct preliminary economic analysis of the undertaken engineering activities and apply mathematical tools to analyse engineering problems	exercises	Wygłoszenie prezentacji
K2A_U21	one applies principles of occupational health and safety in transport	exercises	Wygłoszenie prezentacji
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   The systems safety philosophy, the reason model of systems safety, human factors, technological factors, safety management system (SMS), quality management systems (QMS), environmental management systems (EMS), communication, safety culture, safety accountability, safety targets and performance indicator, hazard and risk management, ISMS training, education and promotion, ISMS documentation and records (procedures), document control arrangements and information management, Emergency response, FEMA, ISMS Audit, integrating the ISMS into the business and operational processes of the organisation, Project: Development of a part of the documentation of an integrated safety management system: vision, mission, policy and objectives of the company, development of two selected system procedures, development of a process map for the company, detailed description of one selected process (human factors, technology, work environment), perform risk analysis for the selected process, preparation of audit questions for the chosen process.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	15
Student's workload n*	
The other**	
Total hours:	**60**
Number of ECTS credits allocated to a course	**3**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students:
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace:
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

7. Detailed description of teaching modes:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

9. Method and procedure for making up for

10. Prerequisites and additional requirements, taking into account the course sequence:

11. Recommended sources and teaching aids:
    5. M. G. Fontana, Corrosion Engineering, Third Edition, McGraw-Hill, New York, 1986.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: INTELIGENT TRANSPORT SYSTEMS
Course code: MK2e_19
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 15;
classes – 15;
laboratory - 0;
projects - 15;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 4
* – *leave the appropriate option*

1. Course objectives:

   Introduction to the key concepts and technologies used in intelligent transport systems, presentation of issues in the deployment of intelligent transport systems
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W10	one has extended knowledge of how modern transport functions and areas connected with it	lecture	test
K2A_W14	one is familiar with basic methods, techniques and tools applied in the designing and analysis of transport systems	lecture	test
K2A_W17	one has knowledge about the state of the art and the latest development trends in transport as well as its impact on the natural environment	lecture	test
			test
Skills: a student can			
K2A_U14	one can analyse and assess various transport systems and propose their suitable modifications and improvements	class	test
K2A_U20	while formulating and solving tasks including the design of transport facilities, systems and processes, one can integrate and systematise knowledge considering non-technical, environmental, economic and legal aspects	case study	report

Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Functional and physical architecture of ITS. ITS deployment policies. European transport projects. American code of practice. Traveler information systems. Incident notification, weather conditions warnings, information management. Electronic payment systems. Traffic monitoring and surveillance. Traffic management systems, arterial management, transit management, intermodal freight. Intelligent vehicles, V2V technology, driver assistance systems, collision avoidance systems. Future prospects and markets, technological trends, standards, competition and policy. Class: Analysis of case studies: traveler information systems, electronic payment systems, traffic monitoring. Discussion of properties and features of Intelligent Transport subsystems: traffic data collection, traffic control, VMS systems, traveller information systems. Project: Presentation of design methods for preparing Intelligent Transport subsystems: Traveler information systems; Weather conditions warnings systems; Electronic payment systems; Traffic monitoring and surveillance; Intelligent vehicles.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	45
Student's workload 1*	15
Student's workload 2*	15
Student's workload n*	30
The other**	30
Total hours:	**135**
Number of ECTS credits allocated to a course	**4**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 45/4
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills - in the case of practical studies: 30/3
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 45
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Wiesław Pamuła dr hab. inż. wieslaw.pamula@polsl.pl

7. Detailed description of teaching modes:
   1. Lecture:
   2. Functional and physical architecture of ITS. ITS deployment policies. European transport projects. American code of practice. Traveler information systems. Incident notification, weather conditions

warnings, information management. Electronic payment systems. Traffic monitoring and surveillance. Traffic management systems, arterial management, transit management, intermodal freight. Intelligent vehicles, V2V technology, driver assistance systems, collision avoidance systems. Future prospects and markets, technological trends, standards, competition and policy.

3. Class:
4. Analysis of case studies: traveler information systems, electronic payment systems, traffic monitoring. Discussion of properties and features of Intelligent Transport subsystems: traffic data collection, traffic control, VMS systems, traveller information systems.
5. Project:

Presentation of design methods for preparing Intelligent Transport subsystems: Traveler information systems; Weather conditions warnings systems; Electronic payment systems; Traffic monitoring and surveillance; Intelligent vehicles.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   Test with open questions. Case study report. End mark is the average for the test and report.

9. Method and procedure for making up for
   Additional tests. Submision of corrected case study report.

10. Prerequisites and additional requirements, taking into account the course sequence:
    knowledge in the fields of: road traffic control and management systems, electronic systems, telecommunication technologies

11. Recommended sources and teaching aids:
    6. P. Kofstad, High Temperature Corrosion, Elsevier Applied Science, London 1988.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    Participation in research project related to ITS.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: MATHEMATICAL MODELS IN TRANSPORT SAFETY
Course code: MK2e_20
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 15;
classes – 15;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

To acquire skills for design, analysis and application of mathematical models in transportation engineering.

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W07	one has extended and advanced knowledge in the field of mathematical methods and analyses applied to describe technical processes, transport systems and processes		
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport		
K2A_W21	one has advanced knowledge related to the application of mathematical methods to describe transport related problems		
Skills: a student can			
K2A_U23	one is capable of conducting an analysis in the field of a technical system reliability and safety		
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

☒ Construction of mathematical models of deterministic discrete and continuous nonlinear systems. ☒ Time series analysis and applications in transportation engineering. ☒ Time series prediction and forecasting – applications in transportation safety. ☒ Attractor embedding from a time series – methods and applications in transportation safety. ☒ Acoustic and vibration signal analysis and preventive fault diagnosis in transportation safety. ☒ Mathematical transforms for signal analysis for transportation safety applications. ☒ Numerical aspects for the implementation of transforms – problems and examples. ☒ Mathematical algorithms for soft computing in transportation safety. ☒ Classification of linear systems. Equilibria, their classification, limit cycles and basin boundaries. ☒ The simplest forms of nonlinearity. Perturbation methods. Applications in transportation safety. ☒ Limit cycles. Asymptotic stability and its evaluation. Applications in transportation safety. ☒ Bifurcations and their classification. Bifurcations in transportation engineering. ☒ Chaos in conservative and dissipative dynamical systems. Applications in transportation safety. ☒ Measures of chaos. Mathematical tools and techniques. ☒ Chaos control – methods and techniques. Applications in transportation safety. Class: ☒ Time series analysis and applications in transportation engineering. ☒ Time series prediction and forecasting – applications in transportation safety. ☒ Acoustic and vibration signal analysis and preventive fault diagnosis in transportation safety. ☒ Mathematical transforms for signal analysis for transportation safety applications. ☒ Numerical aspects for the implementation of transforms – problems and examples.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	
Student's workload 1*	
Student's workload 2*	
Student's workload n*	
The other**	
Total hours:	**0**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students:
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills - in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace:
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

7. Detailed description of teaching modes:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

9. Method and procedure for making up for

10. Prerequisites and additional requirements, taking into account the course sequence:

11. Recommended sources and teaching aids:

7. W. Gao, Z. Li, High-temperature Corrosion and Protection of Materials, Woodhead Publishing in Materials, Cambridge, England, 2008.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: OPTIMIZATION METHODS IN TRANSPORT ENGINEERING
Course code: MK2e_21
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 15;
classes – 15;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   To acquaint with main definitions and results of the theory of optimization. To learn to formulate the optimization problems and to select appropriate algorithms for the solution of problems arising in transportation safety applications.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W07	one has extended and advanced knowledge in the field of mathematical methods and analyses applied to describe technical processes, transport systems and processes		
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport		
K2A_W21	one has advanced knowledge related to the application of mathematical methods to describe transport related problems		
Skills: a student can			
K2A_U23	one is capable of conducting an analysis in the field of a technical system reliability and safety		
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   ☒ Formulation of the optimization problems and their classification. ☒ Effectiveness of algorithms. ☒ Convex sets and functions. ☒ Antigradient methods for problems without limitations. ☒ Newton method and its generalisation. ☒ Necessary and sufficient conditions of the minimum. ☒ Penalty and gradient projection methods. ☒ Lagrange functions methods. ☒ Basic solutions of the linear programming problem. ☒ Simplex method. ☒ Methods of cutting planes. ☒ Internal point methods. ☒ Methods of global optimisation in transport engineering. ☒ Problem of discrete variables in transport engineering. ☒ Evolutionary algorithms for global optimization in transport engineering. Class: ☒ Convex sets and functions. ☒ linear programming problem. ☒ Antigradient methods. ☒ Problem of discrete variables in transport engineering. ☒ Evolutionary algorithms for global optimization in transport engineering.
4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	
Student's workload 1*	
Student's workload 2*	
Student's workload n*	
The other**	
Total hours:	0
Number of ECTS credits allocated to a course	2

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students:
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace:
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

7. Detailed description of teaching modes:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

9. Method and procedure for making up for

10. Prerequisites and additional requirements, taking into account the course sequence:

11. Recommended sources and teaching aids:

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: PROCESS MANAGEMENT FOR THE RISK AND SAFETY CONTROL
Course code: MK2e_22
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 2
Semester: 3
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 0;
projects - 15;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 3
* – *leave the appropriate option*

1. Course objectives:

   The aims of the course are theoretical knowledge of process management and skills for the risk analysis and safety control in transport processes.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W01	one has knowledge required to understand social, legal and other non-technical conditions of engineering activities and knowledge of their application in engineering practice	Lecture, project	Obrona projektu
K2A_W02	one has knowledge necessary to understand economic and other non-technical conditions of engineering activities and knowledge of their application in engineering practice	Lecture, project	Obrona projektu
K2A_W03	one has basic knowledge related to management, including quality management and pursuing of a business activity	Lecture, project	Obrona projektu
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport	Lecture, project	Obrona projektu
K2A_W12	one has knowledge related to transport process management and modelling considering social, economic and legal aspects	Lecture, project	Obrona projektu
Skills: a student can			

Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Differences between project and process. Process management. Identification of proces (mapping). Methods on assesment of proces efectivnes. Different method of risk analysis and management. Basic requirements and best practice in proper risk assessment. Methodology and best practice with use FMEA method. Safety control of transport processes. Class: Time schedule of process. Process planning. Risk analysis with use FMEA method.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	30
Student's workload n*	
The other**	
Total hours:	**75**
Number of ECTS credits allocated to a course	**3**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 30/1
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 0/0
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Associate Professor Rafał Burdzik, DSc PhD Eng rafal.burdzik@polsl.pl

7. Detailed description of teaching modes:
   1. Lectures:
   2. Differences between project and process. Process management. Identification of proces (mapping). Methods on assesment of proces efectivnes. Different method of risk analysis and management. Basic requirements and best practice in proper risk assessment. Methodology and best practice with use FMEA method. Safety control of transport processes.
   3. Project:

   Time schedule of process. Process planning. Risk analysis with use FMEA method.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

   The final grade is determined on the basis of completeness and substantive assessment of the project and the contribution of a single student to the development of the final group work. These rules also apply to credits in correction dates.

9. Method and procedure for making up for
   4. - student's absence from classes:
   5. Participation in classes with another seminar group or individual performance of tasks from classes in which the student did not participate.
   6. - differences in the study programs of persons moving from another field of study, from another university or resuming studies at the Silesian University of Technology,
   7. Preparation in accordance with the guidelines of the lecturer regarding specific differences in study programs resulting from learning outcomes or forms of implementation and achievement of learning outcomes.

10. Prerequisites and additional requirements, taking into account the course sequence:

    Fundamental of management, Fundamental of transport

11. Recommended sources and teaching aids:

    Jan vom Brocke, Michael Rosemann: Handbook on Business Process Management 1: Introduction, Methods, and Information Systems, Springer, 2014

    L. Anthony Cox. Risk Analysis, , Online ISSN: 1539-6924 (on-line access);

    David J. Smith. Reliability maintability and risk – practical methods for engineers, Elsevier 2011r (on-line access)

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

    The lecturer has many years of experience in teaching. Has education in the field of transport and construction as well as machine operation. He also completed postgraduate studies in "Organizational Management".

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: RAMS ANALISYS
Course code: MK2e_23
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 0;
classes – 15;
laboratory - 0;
projects - 15;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 3
* – *leave the appropriate option*

1. Course objectives:

   The aim of the course is to provide knowledge in the field of RAMS and LCC analysis and practical use of this knowledge for the analysis of Reliability, Availability, Manageability and Safety parameters in practice.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W08	one has extended and advanced knowledge in the field of analysis of physical phenomena and solutions of technical problems with the application of the laws of physics in the construction, operation and maintenance of means of transport	classes	Kolokwium
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport	classes	Kolokwium
K2A_W12	one has knowledge related to transport process management and modelling considering social, economic and legal aspects	Project	Obrona projektu
			Obrona projektu
Skills: a student can			
K2A_U23	one is capable of conducting an analysis in the field of a technical system reliability and safety	Project	Obrona projektu
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Classes (practical work): - Practice and the need for RAMS analysis - Product life cycle and relationship with RAMS and LCC - LCC analysis for the client - guidelines; - LCC analysis at product design stage - guidelines; - Analysis of maintenance cycles (DSU) and its relationship with RAMS; - Calculation of RAMS parameters; - Example calculations for LCC to the customer; - An example of LCC analysis for the design of a means of transport; Project: - Analysis of the RAMS for the selected element of the means of transport - Carry out an example LCC analysis for the design of the selected means of transport - Performing LCC analysis for the customer.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	15
Student's workload n*	
The other**	
Total hours:	**60**
Number of ECTS credits allocated to a course	**3**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 15/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 15/2
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Adam Mańka, dr inż., adam.manka@polsl.pl

7. Detailed description of teaching modes:
   Classes (practical work): - Practice and the need for RAMS analysis - Product life cycle and relationship with RAMS and LCC - LCC analysis for the client - guidelines; - LCC analysis at product design stage - guidelines; - Analysis of maintenance cycles (DSU) and its relationship with RAMS; - Calculation of RAMS parameters; - Example calculations for LCC to the customer; - An example of LCC analysis for the design of a means of transport; Project: - Analysis of the RAMS for the selected element of the means of transport - Carry out an example LCC analysis for the design of the selected means of transport - Performing LCC analysis for the customer.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   Arithmetic average of individual forms of classes.

9. Method and procedure for making up for
   In accordance with the study regulations of the Silesian University of Technology. It is possible to do laboratory / exercise classes at the last date of classes or during consultations.

10. Prerequisites and additional requirements, taking into account the course sequence:
    Basic of mathematic, fundamental knowledge of reliability of means transport, fundamental knowledge of safety management and life cycle costs analysis and ISO / IRIS standard

11. Recommended sources and teaching aids:
    17. Vincent DENOEL: An introduction to Reliability Analysis, University of Liege, Environment and Construction - Solid, Structures and Fluid Mechanics Division, January 2007; 18. Fritz Scholz: Weibull Reliability Analysis, Boeing Phantom Works Mathematics & Computing Technology, 1999r; 19. OSKAR LARSSON: Reliability analysis, LUND University, 2015; 20. Scott Speaks: Reliability and MTBF Overview, Vicor Reliability Engineering, 2014; 2. PN-EN 50126 Railway Applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS);

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    The teacher has many years of experience in teaching. Has education in the field of transport and construction as well as machine operation. Has many years of research experience resulting from participation in over 100 scientific and research works carried out for Polish and foreign industry. He is the author of many research, measuring and teaching positions. He participates in many research projects financed from the National Center for Research and Development, KBN, FP5-FP7 and others. Has experience in providing opinions for the needs of judicial authorities in the field of construction and operation of rail vehicles and their cooperation with elements of the railway infrastructure. He is an expert of the National Center for Research and Development in the field of appraisal of applications and evaluation of the correct implementation of research projects related to transport. The lecturer conducts trainings for industry in the subject matter of the subject. Is the lead auditor according to ISO 9001 and internal IRIS veg, SMS and MMS. He is the co-author of the patent: "A device for measuring the pressure of brake pad insertion especially on a railway wheel" Patent. Poland, no. 225 237. Int.Cl. G01L 5/28. Silesian University of Technology, Application. No. 403 293 of 25/03/2013. Publ. 31/03/2017, 6 pp. He is the author of thematic publications, e.g .:

    1. Adam Mańka, Andrzej Hełka, Janusz Ćwiek: Influence of copper content on pantograph contact strip material on maximum temperature of railroad wire. -SC. J. Sil. Univ. Technol., Ser. Transp. 2020 vol. 106, pp. 97-105, bibliography 13 item

    2. Adam Mańka, M. Sitarz: Effects of a thermal load on the wheel / brake-block subsystem The thermal conicity of railway wheels, Proc. Inst. Down. Eng., F J. Rail Rapid Transit 2016 vol. 230 no. 1, pp. 193-205;

    3. Janusz Ćwiek, Mateusz Błach, Stanisław Dacy, Jarosław Jakubczyk, Wojciech Jarczyk, Adam Mańka, Mateusz Oleksik: IoT - Internet of Things as a tool for measuring comfort and ensuring safety in public transport. -Komun. Publiczna 2018 No. 3, pp. 23-29, bibliogr. 16 item 4. Adam Mańka: Transport problems 2018. X International scientific conference, 27.06-29.06.2018, Katowice, Wisła. VII International symposium of young researchers, 25.06-26.06.2018, Katowice. Proceedings.

    5. Andrzej Hełka, Adam Mańka: Operation of current collectors equipped with carbon contact strips - problems, measurements, remarks. -PR. Sciences. Warsaw, Transp. 2017, pp. 116, pp. 83-90, bibliography 15 item

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: RESEARCH ON SAFETY AND COMFORT OF MEANS OF TRANSPORT
Course code: MK2e_24
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 0;
projects - 15;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   The aims of the course are theoretical knowledge of principles of safety and comfort, including research methods and skills for the selection of requirements of safety and comfort in means of transport and recognition the risks from exposure to noise and vibration for human.

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport	Lecture, project	Obrona projektu
Skills: a student can			
K2A_U01	one can interpret and explain social phenomena and mutual relations between phenomena	Lecture, project	Obrona projektu
K2A_U19	one can conduct critical analysis and plan transport processes	Lecture, project	Obrona projektu
K2A_U21	one applies principles of occupational health and safety in transport	Lecture, project	Obrona projektu
Social competences: a student is prepared to			
K2A_K02	one is aware of the relevance and understands non-technical aspects and effects of engineering activities, including its environmental impact and the related responsibility for the decisions made	Lecture, project	Obrona projektu

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Determination of fundamentals needs and requirements due to safety and comfort of transport system. Analysis of noise and vibration in terms of safety and comfort. Fundamental principles of safety and comfort in means of transport. Passive and active safety in vehicles. Subjective properties of comfort in transport. Research methods on safety and comfort. Class: Interpretation of methods for assessment of safety and comfort in means of transport – case study for different means of transport. Analysis of noise and vibration influence on comfort. Identification components and determinants of comfort analysis (size, space, time, equipment…).

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	10
Student's workload 2*	15
Student's workload n*	
The other**	
Total hours:	**55**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 30/1
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 0/0
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Associate Professor Rafał Burdzik, DSc PhD Eng rafal.burdzik@polsl.pl

7. Detailed description of teaching modes:
   1. Lectures:
   2. Determination of fundamentals needs and requirements due to safety and comfort of transport system. Analysis of noise and vibration in terms of safety and comfort. Fundamental principles of safety and comfort in means of transport. Passive and active safety in vehicles. Subjective properties of comfort in transport. Research methods on safety and comfort.
   3. Project:

   Interpretation of methods for assessment of safety and comfort in means of transport – case study for different means of transport. Analysis of noise and vibration influence on comfort. Identification components and determinants of comfort analysis (size, space, time, equipment…).

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

   The final grade is determined on the basis of completeness and substantive assessment of the project and the contribution of a single student to the development of the final group work. These rules also apply to credits in correction dates.

9. Method and procedure for making up for
   4. - student's absence from classes:
   5. Participation in classes with another seminar group or individual performance of tasks from classes in which the student did not participate.
   6. - differences in the study programs of persons moving from another field of study, from another university or resuming studies at the Silesian University of Technology,
   7. Preparation in accordance with the guidelines of the lecturer regarding specific differences in study programs resulting from learning outcomes or forms of implementation and achievement of learning outcomes.

10. Prerequisites and additional requirements, taking into account the course sequence:

    Fundamentals of means of transport

11. Recommended sources and teaching aids:

    George A. Peters, Barbara J. Peters: Automotive Vehicle Safety, CRC Press, 2003

    Mike Tovey: Design for Transport: A User-Centred Approach to Vehicle Design and Travel, Routledge, 2016

    Frank Fahy, John Walker: Advanced Applications in Acoustics, Noise and Vibration, CRC Press, 2004

    Norton,D. G. Karczub.: Fundamentals of Noise and Vibration Analysis for Engineers, Cambridge University Press, 2003

    Identyfication of sources, propagation and structure of vibrations affecting men in means of transport based on the example of automotive vehicles. Burdzik R., JVE Book Series on Vibroengineering ; vol. 1 2351-5261

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

    The lecturer has many years of experience in teaching. Has education in the field of transport and construction as well as machine operation. He is the author of thematic publications, e.g .:

    Identyfication of sources, propagation and structure of vibrations affecting men in means of transport based on the example of automotive vehicles. Burdzik R., JVE Book Series on Vibroengineering ; vol. 1 2351-5261

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: SAFETY AND RELIABILITY OF MEANS OF TRANSPORT
Course code: MK2e_25
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 2
Semester: 3
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 0;
projects - 15;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   Main objective of the course is to complement the student's knowledge of the basic of reliability and safety in means of transport

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport	lecture	final test
Skills: a student can			
K2A_U23	one is capable of conducting an analysis in the field of a technical system reliability and safety	Laboratory	Report answer
Social competences: a student is prepared to			
K2A_K03	one can collaborate in a group of people, assuming different roles	lecture	final test

3. The content of study programme ensuring learning outcomes (according to the study programme):

General concepts of reliability. Essence and principles of reliability tests. Reliability indicators - their choice in the evaluation of the engineering systems operation. Analysis of systems failures using numerical methods and analysis of reliability of means of transport taking into account design and operation requirements. Criteria for estimation system reliability. Estimation methods and risk and safety management. Security risk. Laboratory: 1. Analysis of operating data according to variable operating conditions. 2. Determination of basic reliability indicators based on operational data. 3. Computer modeling of selected engineering objects in terms of their reliability and safety. 4. Use of numerical methods in the reliability testing of engineering systems. 5. Analysis of results using statistical and quantitative methods.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	10
Student's workload n*	
The other**	15
Total hours:	**70**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills - in the case of practical studies: 1
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace:
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Henryk Bąkowski, dr hab. inż. e-mail: henryk.bakowski@polsl.pl

7. Detailed description of teaching modes:
   1. Lectures:
   2. General concepts of reliability. Essence and principles of reliability tests.
   3. Reliability indicators - their choice in the evaluation of the engineering systems operation.
   4. Analysis of systems failures using numerical methods and analysis of reliability of means of transport taking into account design and operation requirements. Criteria for estimation system reliability. Estimation methods and risk and safety management. Security risk.
   5.
   6. Project:

   Decision theory and operational data analysis. Decision matrix. Determination of basic reliability measures of technical objects. Modeling and simulation of simple and complex systems. Analysis of types, effects and criticality of damage and wear. Reliable optimization of selected means of transport.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

   Ocena końcowa z przedmiotu to wartość średniej arytmetycznej z oceny z wykładu oraz oceny z zajęć ćwiczeniowych

9. Method and procedure for making up for

   7. -nieobecności studenta na zajęciach,

   W zależności od formy opuszczonych zajęć ustala to prowadzący na konsultacjach zgodnie z formami prowadzenia zajęć i warunkami zaliczenia

10. Prerequisites and additional requirements, taking into account the course sequence:

    the knowledge and skills (on average level) in mathematics on the secondary school level

11. Recommended sources and teaching aids:

    Primary sources:

    1. Koronacki J., Mielniczuk J.: Statystyka dla kierunków technicznych. Wydawnictwa Naukowo-Techniczne, Warszawa 2001.

    2. Migdalski J. Inżynieria niezawodności. Poradnik. Wydawnictwo ATR Bydgoszcz i ZETOM Warszawa 1992

    3. Szopa T.: Niezawodność i bezpieczeństwo. Oficyna Wydawnicza Politechniki Warszawskiej. Warszawa 2009

    Secondary sources:

    1. R.D.J.M. Steenbergen, P.H.A.J.M. van Gelder, S. Miraglia, A.C.W.M. Vrouwenvelder: Safety, Reliability and Risk Analysis: Beyond the Horizon. 2013 by CRC Press. ISBN 9781138001237 - CAT# K22452.

    2. David J. Smit: Reliability, Maintainability and Risk.

    Reliability, Maintainability and RiskPractical Methods for Engineers including Reliability Centred Maintenance and Safety-Related Systems. Copyright © 2011 Elsevier Ltd . ISBN: 978-0-08-096902-2.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

    W. Samociuk, Z. Krzysiak, G. Bartnik, A. Skic, S. Kocira, B. Rachwał, Henryk Bąkowski, S. Wierzbicki, L. Krzywonos: Analysis of explosion hazard on propane-butane liquid gas distribution stations during self tankage of vehicles. Przem. Chem. 2017 t. 96 nr 4, s. 874-879.

    Robert Wieszała, Jarosław Piątkowski, Henryk Bąkowski: Application of FEM analysis for evaluation of the stress and deformation distributions in the top layer of A390.0 alloy during friction. Arch. Foundry Eng. 2017 vol. 17 iss. 1, s. 228-234.

    Henryk Bąkowski, Grzegorz Peruń: Analysis of the collision between the vehicle - energy-absorbing barrier by using finite element method (FEM). Mag. Autostrady 2016 nr 4, s. 68-70.

    Henryk Bąkowski, Janusz Adamiec: Determination of the fatigue life on the basis of fatigue test and FEM for EN-MCMgY4RE3Zr with rare earth elements. Springer Proceedings in Mathematics & Statistics ; vol. 182 2194-1009.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: SAFETY IN LOGISTICS
Course code: MK2e_26
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 15;
classes – 15;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   The aim of the course is to familiarize students with the major issues related to safety in logistics in terms of Polish and foreign trade. Preparing students to work within enterprises of international trade by identifying the basic phenomena and processes related to the movement of goods and risks connected with it. To familiarize students with English terminology of the topics discussed.

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W12	one has knowledge related to transport process management and modelling considering social, economic and legal aspects	lecture	Kolokwium
K2A_W13	one has knowledge in the field of transport and logistic systems as well as their development trends and technical assistance methods for their processes	lecture	Kolokwium
Skills: a student can			
K2A_U16	one can design technical back-up elements, facilities and systems for transport and logistics infrastructure with the consideration of given utility and economic criteria, using appropriate methods, techniques and tools		
K2A_U22	on the basis of the assessment of applicability of methods, tools and new engineering achievements and applying new conceptual methods, one can solve complex or atypical engineering tasks,	exercises	Wygłoszenie prezentacji

	including research tasks in the fields of transport or logistics		
Social competences: a student is prepared to			
		exercises	
		exercises	Wygłoszenie prezentacji

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Etymology, history and definition of logistics. Safety in logistics management. Safety of logistics system in the enterprise. Safety of supply chains. Safety of procurement logistics. Safety of production logistics. Safety of distribution logistics. Safety of transport logistics. Safety of warehousing logistics. Safety of packaging logistics. Safety of general logistics and international supply chains. Safety of customer service. Safety od logistics outsourcing. Safety of multimodal transport. Safety of reverse logistics. Safety of express logistics services.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	5
Student's workload 2*	5
Student's workload n*	
The other**	
Total hours:	**40**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 30
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Maria Cieśla, dr inż., e-mail: maria.ciesla@polsl.pl

7. Detailed description of teaching modes:
   1. Detailed program content: Etymology, history and definition of logistics. Safety in logistics management. Safety of logistics system in the enterprise. Safety of supply chains. Safety of procurement logistics. Safety of production logistics. Safety of distribution logistics. Safety of transport logistics. Safety of warehousing logistics. Safety of packaging logistics. Safety of general logistics and international

supply chains. Safety of customer service. Safety od logistics outsourcing. Safety of multimodal transport. Safety of reverse logistics. Safety of express logistics services.

2. Teaching methods used, including distance learning methods and techniques: Multimedia presentation, Course on the subject prepared on the e-learning platform: https://platforma.polsl.pl
3. The form and criteria of assessment, including the principle of correction of records, as well as the conditions for admission to the exam: Completion of the lecture is based on a positive evaluation of the written test, which is a single-choice test. A condition for a positive assessment is to obtain a minimum of 60% of the points that can be obtained in the test. Improvement of the test is possible once and takes the form of a retest, the final grade being the arithmetic mean of the first grade obtained and the grade obtained from the improvement.

Organization of classes and rules for participation in classes, with an indication of whether student attendance is obligatory: Attending lecture classes is not obligatory. Attending exercises is obligatory.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

9. Method and procedure for making up for
   Depending on the form of abandoned classes, it is determined by the teacher during consultations in accordance with the forms of conducting classes and the conditions for evaluation

10. Prerequisites and additional requirements, taking into account the course sequence:
    Pre-requisite qualifications: Mathematics, Operational Research

11. Recommended sources and teaching aids:
    1. Donald F. Wood: International Logistics, Springer, USA 1995

    2. Douglas Long: International Logistics: Global Supply Chain Management, Springer, USA 2003

    3. C. Donald J. Waters: Global logistics:new directions in supply chain management, Kogan Page Publishers, 2007. 4. C. Donald J. Waters: Logistics: An Introduction to Supply Chain Management, Palgrave Macmillan, 2003

    5. C. Donald J. Waters, Donald Waters: Global logistics and distribution planning: strategies for management, Kogan Page, 1999

    6. John Mangan, Chandra Lalwani, Tim Butcher: Global Logistics and Supply Chain Management, John Wiley & Sons, 10 cze 2008.

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    Description of competences: Completed studies related to the specialty in the field of Logistic Management or Logistics, the experience of conducting classes on the specialty Transport Logistics

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: STRUCTURAL HEALT MONITORING SYSTEM
Course code: MK2e_27
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 2
Semester: 3
Teaching modes and teaching hours:
lectures – 0;
classes – 15;
laboratory - 15;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 3
* – *leave the appropriate option*

1. Course objectives:

   Theoretical knowledge of measurements of mechanical values by using the structural health monitoring methods (sensors, monitoring system design). The practical application of theoretical knowledge and skills learned in the course of the laboratory.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W06	one has advanced knowledge about the principles of conducting physical measurements and processing their results, measurement uncertainties and methods of their determination and presentation		
K2A_W07	one has extended and advanced knowledge in the field of mathematical methods and analyses applied to describe technical processes, transport systems and processes		
K2A_W08	one has extended and advanced knowledge in the field of analysis of physical phenomena and solutions of technical problems with the application of the laws of physics in the construction, operation and maintenance of means of transport		
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport		
Skills: a student can			

Social competences: a student is prepared to			
K2A_K02	one is aware of the relevance and understands non-technical aspects and effects of engineering activities, including its environmental impact and the related responsibility for the decisions made		

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Maintenance Systems. Diagnostic procedures. Diagnostic methods: health monitoring (SHM). Designed of health monitoring system. Laboratory:. Calibration of measuring system and calculation of uncertainty. Methods of measurement physical parameters. Methods of signal processing and analyze. Signal processing methods.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	
Student's workload 1*	
Student's workload 2*	
Student's workload n*	
The other**	
Total hours:	**0**
Number of ECTS credits allocated to a course	**3**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students:
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace:
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

7. Detailed description of teaching modes:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

9. Method and procedure for making up for

10. Prerequisites and additional requirements, taking into account the course sequence:

11. Recommended sources and teaching aids:

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: THEORY AND PRACTISE OF RISK ANALYSIS
Course code: MK2e_28
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 0;
projects - 15;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 3
* – *leave the appropriate option*

1. Course objectives:

   The aims of the course are theoretical knowledge of methodology of risk analysis and reliability estimation and practical application of theoretical knowledge and skills learned in the course. Presentation of the best known methods of risk analysis with practical use.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport	lecture	Egzamin
K2A_W19	one has knowledge required to understand economic and other non-technical conditions of engineering activities and principles of occupational health and safety applied in engineering work	Lecture	Egzamin
Skills: a student can			
K2A_U15	one can identify and verify transport elements, devices and processes	Lecture	Egzamin
K2A_U19	one can conduct critical analysis and plan transport processes	Classes	Kolokwium
K2A_U23	one is capable of conducting an analysis in the field of a technical system reliability and safety	Classes	Kolokwium
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   - Safety management system – basis information and legal requirement; - Terms and definitions related to risk analysis, classification - Hazards - identification methods, data acquiring from the records existing in the enterprise; - Human factor; - Risk analysis - various methods used in the world in the aviation, rail, chemical industry - disadvantages; - Risk assessment - template evaluation; - Detailed approach to FMEA and pFMEA; - Good practices in risk analysis and safety management; - Use of risk analysis in the process of improving safety; - Safety aspect included in quality standard and technical standards ISO, IRIS – RAMS. Classes (practical work): - Methodology of hazard identification – sources of data acquiring; - Risk assessment in practice; - Risk analysis by FMEA and pFMEA method; - Risk analysis by COSO II method; - Risk analysis by FTA method; - Risk analysis by ETA method; - Corrective and preventive actions and emergency plans.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	15
Student's workload n*	
The other**	
Total hours:	**60**
Number of ECTS credits allocated to a course	**3**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 15/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 15/1
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Adam Mańka, dr inż., adam.manka@polsl.pl

7. Detailed description of teaching modes:

   Lecture: - Safety management system – basis information and legal requirement; - Terms and definitions related to risk analysis, classification - Hazards - identification methods, data acquiring from the records existing in the enterprise; - Human factor; - Risk analysis - various methods used in the world in the aviation, rail, chemical industry - disadvantages; - Risk assessment - template evaluation; - Detailed approach to FMEA and pFMEA; - Good practices in risk analysis and safety management; - Use of risk analysis in the process of improving safety; - Safety aspect included in quality standard and technical standards ISO, IRIS – RAMS. Classes (practical work): - Methodology of hazard identification – sources of data acquiring; - Risk assessment in practice; - Risk analysis by FMEA and pFMEA method; - Risk analysis by COSO II method; -

Risk analysis by FTA method; - Risk analysis by ETA method; - Corrective and preventive actions and emergency plans.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   Arithmetic average of individual forms of classes.

9. Method and procedure for making up for
   In accordance with the study regulations of the Silesian University of Technology. It is possible to do laboratory / exercise classes at the last date of classes or during consultations.

10. Prerequisites and additional requirements, taking into account the course sequence:
    Basic of mathematic, fundamental knowledge of means of transport

11. Recommended sources and teaching aids:
    21. Anne Hill: Risk Management Handbook, University of Adelaide, 2016; 22. Paul Slovic, Melissa L. Finucane, Ellen Peters, Donald G. MacGregor: Risk as Analysis and Risk as Feelings: Some Thoughts about Affect, Reason, Risk, and Rationality, 13 April 2004. 23. Haring I.: Introduction to Risk Analysis and Risk Management Processes, Springer, 2015; 24. Patchin Curtis, Mark Carey: Risk Assessment - Standard for Performing a Failure Mode and Effects Analysis (FMEA) and Establishing a Critical Items List (CIL), NASA, 2010; Necessary EN-ISO and national standards concerning safety management system and risk analysis 4. IEC 60812 - Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA)

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    The teacher has many years of experience in teaching. Has education in the field of transport and construction as well as machine operation. Has many years of research experience resulting from participation in over 100 scientific and research works carried out for Polish and foreign industry. He is the author of many research, measuring and teaching positions. He participates in many research projects financed from the National Center for Research and Development, KBN, FP5-FP7 and others. Has experience in providing opinions for the needs of judicial authorities in the field of construction and operation of rail vehicles and their cooperation with elements of the railway infrastructure. He is an expert of the National Center for Research and Development in the field of appraisal of applications and evaluation of the correct implementation of research projects related to transport. The lecturer conducts trainings for industry in the subject matter of the subject. Is the lead auditor according to ISO 9001 and internal IRIS veg, SMS and MMS. He is the co-author of the patent: "A device for measuring the pressure of brake pad insertion especially on a railway wheel" Patent. Poland, no. 225 237. Int.Cl. G01L 5/28. Silesian University of Technology, Application. No. 403 293 of 25/03/2013. Publ. 31/03/2017, 6 pp. He is the author of thematic publications, e.g .:

    1. Adam Mańka, Andrzej Hełka, Janusz Ćwiek: Influence of copper content on pantograph contact strip material on maximum temperature of railroad wire. -SC. J. Sil. Univ. Technol., Ser. Transp. 2020 vol. 106, pp. 97-105, bibliography 13 item

    2. Adam Mańka, M. Sitarz: Effects of a thermal load on the wheel / brake-block subsystem The thermal conicity of railway wheels, Proc. Inst. Down. Eng., F J. Rail Rapid Transit 2016 vol. 230 no. 1, pp. 193-205;

    3. Janusz Ćwiek, Mateusz Błach, Stanisław Dacy, Jarosław Jakubczyk, Wojciech Jarczyk, Adam Mańka, Mateusz Oleksik: IoT - Internet of Things as a tool for measuring comfort and ensuring safety in public transport. -Komun. Publiczna 2018 No. 3, pp. 23-29, bibliogr. 16 item 4. Adam Mańka: Transport problems 2018. X International scientific conference, 27.06-29.06.2018, Katowice, Wisła. VII International symposium of young researchers, 25.06-26.06.2018, Katowice. Proceedings.

5. Andrzej Hełka, Adam Mańka: Operation of current collectors equipped with carbon contact strips - problems, measurements, remarks. -PR. Sciences. Warsaw, Transp. 2017, pp. 116, pp. 83-90, bibliography 15 item

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: THEORY OF RELIABILITY AND SAFETY
Course code: MK2e_29
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 15;
classes – 15;
laboratory - 0;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   gain basic skills and competence in reliability analysis of technical systems
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport	lecture	test
Skills: a student can			
K2A_U17	one can make the use of standards, catalogues, technical documentation and other sources in order to perform various engineering tasks, including materials in foreign languages	lecture	test
K2A_U18	one applies databases and Internet-based sources to perform engineering tasks	lecture	test
K2A_U23	one is capable of conducting an analysis in the field of a technical system reliability and safety	lecture	test
Social competences: a student is prepared to			
K2A_K03	one can collaborate in a group of people, assuming different roles	lecture	test

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Definition and discussion of basic terms used for reliability evaluation. Basic life time distribution models used for non-repairable populations. Basic repair rate models used for repairable systems. Reliability block diagrams and fault trees. Complex systems. Redundancy. Analysis of repairable systems by Markov methods. System failure analysis based on FMECA. Safety and critical systems. Analysis of safety using HAZOP. Class: Analysis of complex systems reliability using reliability block diagrams. FTA – case studies. Determination of life time distribution models of non repairable populations. FMECA and HAZOP - case studies.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	15
Student's workload n*	
The other**	
Total hours:	**60**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30/1
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Wiesław Pamuła dr hab. inż. wieslaw.pamula@polsl.pl

7. Detailed description of teaching modes:
   1. 1) wykłady:
   2. - szczegółowe treści programowe:
   3. Basic reliability terms, reliability data collecting and censoring, modelling reliability, life data analysis, probability density functions, PDF parameter estimation, reliability data collection, confidence bounds, structural reliability analysis, Reliability Block Diagrams, Fault Tree Analysis, Failure Mode Effects Analysis, HAZOP, Markov processes, repairable systems, Poisson distribution, maintenance terms, Bayesian methodology for reliability analysis, RAMS, Safety Management Systems
   4. - stosowane metody kształcenia, w tym metody i techniki kształcenia na odległość:

   prezentacja multimedialna, dodatkowe materiały i treść prezentacji dostępne na Platformie Zdalnej Edukacji Wydziału Transportu na kursie „Theory of Reliability and Safety", konsultacje,

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
   Written test with open questions. End mark is the mean of answer marks.

9. Method and procedure for making up for
   extra written test

10. Prerequisites and additional requirements, taking into account the course sequence:
    mathematics, statistics

11. Recommended sources and teaching aids:
    R. F. Stapelberg: Handbook of Reliability, Availability, Maintainability and Safety in Engineering Design, Springer 2016

    W. Pamuła: Niezawodność i bezpieczeństwo. Wybór zagadnień. Wydawnictwo Pol.Śl. Gliwice 2011.

    B. Bertsche: Reliability in Automotive and Mechanical Engineering Determination of Component and System

    Reliability, Series: VDI-Buch Springer Verlag 2008.

    Standard PN-EN 60812:2006 FMECA.

    Standard PN-EN 61882 HAZOP

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    Author of text book: W. Pamuła: Niezawodność i bezpieczeństwo. Wybór zagadnień. Wydawnictwo Pol. Śl. Gliwice 2011. Author of study reports in the field of reliability analysis.

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: TRANSPORT NOISE AND VIBRATION
Course code: MK2e_30
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 2
Semester: 3
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 15;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   Theoretical knowledge of environmental impact of transport and research methods on noise and vibration. Fundamental knowledge on signal processing. The practical application of theoretical knowledge and skills learned in the course of the class and project. Evaluation of exposure to noise and vibration in transport.
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W01	one has knowledge required to understand social, legal and other non-technical conditions of engineering activities and knowledge of their application in engineering practice	Lecture, laboratory	Opracowanie sprawozdań lub raportów
K2A_W02	one has knowledge necessary to understand economic and other non-technical conditions of engineering activities and knowledge of their application in engineering practice	Lecture, laboratory	Opracowanie sprawozdań lub raportów
K2A_W06	one has advanced knowledge about the principles of conducting physical measurements and processing their results, measurement uncertainties and methods of their determination and presentation	Lecture, laboratory	Opracowanie sprawozdań lub raportów
			Opracowanie sprawozdań lub raportów
Skills: a student can			
K2A_U10	one can plan and conduct experiments concerning simple research problems using diverse methods of analysis or simulation, interpret the obtained results	Lecture, laboratory	Opracowanie sprawozdań lub raportów

	and draw conclusions or formulate hypotheses		
Social competences: a student is prepared to			
K2A_K02	one is aware of the relevance and understands non-technical aspects and effects of engineering activities, including its environmental impact and the related responsibility for the decisions made	Lecture, laboratory	Opracowanie sprawozdań lub raportów

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Environmental impact of transport. Transport as source of noise and vibration. Sources of noises and vibration in transport. Propagation of noise and vibration in transport system and environment. Methods of measurements of noise and vibration. Methods of minimizing vibration and noise. Analysis of the signals in the domains amplitude, time and frequency. Absolute and relative scales. Equations on the relative scales. Correction curves A, B, C, D. Evaluation of noise and vibration hazard for continuous and intermittent exposure. Laboratory: Analysis of measurements methods of noise and vibration. Sensors, data acquisition units and complex systems for measurements. Comparison of noise reduction methods in transport. Relation between traffic volume and noise and vibration. Noise and vibration for different means of transport.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	15
Student's workload 2*	30
Student's workload n*	
The other**	
Total hours:	**75**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30/1
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 30/1
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 0/0
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Associate Professor Rafał Burdzik, DSc PhD Eng rafal.burdzik@polsl.pl

7. Detailed description of teaching modes:
    1. Lectures:
    2. Environmental impact of transport. Transport as source of noise and vibration. Sources of noises and vibration in transport. Propagation of noise and vibration in transport system and environment. Methods of measurements of noise and vibration. Methods of minimizing vibration and noise. Analysis of the signals in the domains amplitude, time and frequency. Absolute and relative scales. Equations on the relative scales. Correction curves A, B, C, D. Evaluation of noise and vibration hazard for continuous and intermittent exposure.
    3. Laboratory:

    Analysis of measurements methods of noise and vibration. Sensors, data acquisition units and complex systems for measurements. Comparison of noise reduction methods in transport. Relation between traffic volume and noise and vibration. Noise and vibration for different means of transport.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):
    The final grade is determined on the basis of completeness and substantive assessment of the reports and the contribution of a single student to the development of the final group work. These rules also apply to credits in correction dates.

9. Method and procedure for making up for
    4. - student's absence from classes:
    5. Participation in classes with another seminar group or individual performance of tasks from classes in which the student did not participate.
    6. - differences in the study programs of persons moving from another field of study, from another university or resuming studies at the Silesian University of Technology,
    7. Preparation in accordance with the guidelines of the lecturer regarding specific differences in study programs resulting from learning outcomes or forms of implementation and achievement of learning outcomes.

10. Prerequisites and additional requirements, taking into account the course sequence:
    Mathematics, Physics, Means of transport, Fundamentals of noise and vibration

11. Recommended sources and teaching aids:
    Frank J. Fahy, Paolo Gardonio.: Sound and Structural Vibration: Radiation, Transmission and Response, Academic Press Oxford, 2007, Access Online via Elsevier

    Tatsuo Maeda, et all.: Noise and Vibration Mitigation for Rail Transportation Systems, Springer Science & Business Media, 2011

    Norton,D. G. Karczub.: Fundamentals of Noise and Vibration Analysis for Engineers, Cambridge University Press, 2003

    Identyfication of sources, propagation and structure of vibrations affecting men in means of transport based on the example of automotive vehicles. Burdzik R., JVE Book Series on Vibroengineering ; vol. 1 2351-5261

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):
    The lecturer has many years of experience in teaching. Has education in the field of transport and construction as well as machine operation. He is the author of thematic publications, e.g .:

Identyfication of sources, propagation and structure of vibrations affecting men in means of transport based on the example of automotive vehicles. Burdzik R., JVE Book Series on Vibroengineering ; vol. 1 2351-5261

13. Other information:

Detailed course description
(SUBJECT CARD)

Course title: TRANSPORT SAFETY MANAGEMENT SYSTEM
Course code: MK2e_31
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 0;
projects - 15;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

   to gain knowledge, skills - competences in creation of SMS and management of safety in any areas of transport
2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W01	one has knowledge required to understand social, legal and other non-technical conditions of engineering activities and knowledge of their application in engineering practice	Lecture, project	test
K2A_W03	one has basic knowledge related to management, including quality management and pursuing of a business activity	Lecture, project	test
K2A_W11	one has advanced knowledge in the field of reliability and safety in transport	Lecture, project	test
K2A_W14	one is familiar with basic methods, techniques and tools applied in the designing and analysis of transport systems	Lecture, project	test
Skills: a student can			
K2A_U11	one can apply systemic approach considering non-technical aspects in engineering tasks	Project	test
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

Introduction to transport safety: the concept of safety, evaluation of safety thinking, theoretical models related to safety, safety culture, safety law for areas of transport. Introduction to safety management: factors influencing safety management, strategies for safety management, steps of safety management, responsibilities for safety management. Safety risk: safety risk management, safety risk probability and severity, safety risk tolerability, safety risk control / mitigation, risk management process. Introduction to safety management system: SMS definition, SMS description, SMS Gap analysis, SMS-SSP-QMS interactions. State safety program: Components and elements of SSP in areas of transport, ICAO SSP, SSP development, SSP implementation. Concepts and models related to transport safety: Reason model and accident caution, SHELL model, Model 5M, Errors and violation., Model – H-M-O-E – description by factors. Safety Hazards: Understanding of hazards and consequences, Hazard identification and consequences, Documentation of hazards, Management of safety information. Safety risk management process: practical exercises according to scenarios. SMS Planning: ICAO SMS framework, SMS commitment, responsibility and accountability, SMS documentation, SMS implementation plan. SMS operation: Safety risk management, Safety performance, monitoring and measurement, Improvement of SMS, Safety promotion. Phased SMS implementation: Planning SMS implementation, Reactive safety management, Proactive and predictive safety management process, Operational safety assurance. National lessons observed on SSP development and implementation: study of accessible examples. Project: Academic Fundamentals - definition, common misconceptions about academic writing, elements of academic writing, academic terms, the research process - select topic, formulate a research question, design the study, collect the data, analyze the data, write the report, the final product - introduction, literature review, methodology, findings, discussion, conclusion, references, definitions and examples of cheating and plagiarism, what requires a citations, what does not requires a citations, exercises. Topics for discussion: Using and citing sources. From topic to research questions. The paper proposal. Quoting and summarizing. The literature review. The body of the paper. The introduction. Logical and critical writing. Revising for grammar and style. Preparing the final draft.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30
Student's workload 1*	20
Student's workload 2*	10
Student's workload n*	
The other**	
Total hours:	**60**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: 30/2
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: 30/2
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies: 15/1

– number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: 30

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

   Associate Professor Jarosław Kozuba, DSc PhD Eng

7. Detailed description of teaching modes:
   1. Lectures: Introduction to transport safety: the concept of safety, evaluation of safety thinking, theoretical models related to safety, safety culture, safety law for areas of transport. Introduction to safety management: factors influencing safety management, strategies for safety management, steps of safety management, responsibilities for safety management. Safety risk: safety risk management, safety risk probability and severity, safety risk tolerability, safety risk control / mitigation, risk management process. Introduction to safety management system: SMS definition, SMS description, SMS Gap analysis, SMS-SSP-QMS interactions. State safety program: Components and elements of SSP in areas of transport, ICAO SSP, SSP development, SSP implementation.

   Project: Academic Fundamentals - definition, common misconceptions about academic writing, elements of academic writing, academic terms, the research process - select topic, formulate a research question, design the study, collect the data, analyze the data, write the report, the final product - introduction, literature review, methodology, findings, discussion, conclusion, references, definitions and examples of cheating and plagiarism, what requires a citations, what does not requires a citations, exercises. Topics for discussion: Using and citing sources. From topic to research questions. The paper proposal. Quoting and summarizing. The literature review. The body of the paper. The introduction. Logical and critical writing. Revising for grammar and style. Preparing the final draft.

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

   Conditions which should be fulfilled by students to be qualified for the exam: 70% of attendance at the lecture and exercises, positive score with five exercises – both Power Point presentations and written report, positive score with project thesis. Fina

9. Method and procedure for making up for
   2. Student's absence from classes:

   Participation in classes with another seminar group or after agreeing with the teacher on the individual performance of tasks from classes in which the student did not participate.

10. Prerequisites and additional requirements, taking into account the course sequence:

    It does not require knowledge / skills of any specific introducing subjects

11. Recommended sources and teaching aids:

    Primary sources:

    1. ICAO, Safety Management Manual – 3th Edition, ICAO, Quebec 2013

    2. J. A. Stolzer, C.D. Halfard, I. Goglia, Safety Management System in Aviation, ASHGATE, Burlington 2006

    3. FAA, SMS Manual, FAA, New York 2004

    4. J.W.T. Thomas, A systematic review of the effectiveness of SMS, ASTB, Austria 2010

    5. APT Research, System Safety Metrics Method, APT, Alabama 2009

    6. SMS PT, Background and Fundamentals of the Safety Management System (SMS), for aviation operation, ALPA, New York 2006 - http://ihst.rotor.com/Portals/54/Aviation%20SMS%20Background-Fundamentals.pdf

Secondary sources:

1.Railway SMS - https://www.onrsr.com.au/__data/assets/pdf_file/0015/1923/Guideline-Preparation-of-a-Rail-Safety-Management-System.pdf

2. Safety Measurement System (SMS) Methodology: Behavior Analysis and Safety Improvement Category (BASIC) Prioritization Status - https://csa.fmcsa.dot.gov/Documents/SMSMethodology.pdf

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

Specialized education, many years of experience in the field of presented content and scientific publications in the field of the subject

13. Other information:

lack

Detailed course description
(SUBJECT CARD)

Course title: VEHICLE SAFETY SYSTEMS
Course code: MK2e_32
Classification of a course group: Speciality courses
Course type: core
elective
Field of study: TRANSPORT
Level of study: MSc level
Profile of study: general academic
Mode of study: full-time programme
Specialty (specialisation): Transport Safety Systems
Year of study: 1
Semester: 2
Teaching modes and teaching hours:
lectures – 15;
classes – 0;
laboratory - 15;
projects - 0;
seminars - 0.
Language/s of instruction: english
Number of ECTS credits (according to the study programme): 2
* – *leave the appropriate option*

1. Course objectives:

Understanding the construction and operation of components and systems to ensure vehicle safety

2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes *a student who completed the course:*	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
K2A_W17	one has knowledge about the state of the art and the latest development trends in transport as well as its impact on the natural environment		
Skills: a student can			
K2A_U15	one can identify and verify transport elements, devices and processes		
K2A_U20	while formulating and solving tasks including the design of transport facilities, systems and processes, one can integrate and systematise knowledge considering non-technical, environmental, economic and legal aspects		
K2A_U21	one applies principles of occupational health and safety in transport		
K2A_U22	on the basis of the assessment of applicability of methods, tools and new engineering achievements and applying new conceptual methods, one can solve complex or atypical engineering tasks, including research tasks in the fields of transport or logistics		
Social competences: a student is prepared to			

3. The content of study programme ensuring learning outcomes (according to the study programme):

   Identification of sources of hazards. Definitions - active and passive safety. Braking process. Comparative analysis of permissible and actual forces acting on the vehicle. Construction and operation of braking systems. Systems supporting the braking process. ABS / ASR systems. Curvilinear motion of the vehicle. Displacement of center of gravity due to lateral forces. Wheel collaboration with the surface. Tires of the wheel. Steering system. Geometry and construction of the suspension system. Traction Control Systems ESP. Active stabilization system of vehicle dynamic. Fuel system safety. Tanks, liquid and gaseous fuels in the light of the approval requirements. Passive safety systems to protect against the effects of collisions. Laboratory: Project of vehicle dynamics in curvilinear motion. Methods of determining the center of gravity of the vehicle. The calculation of braking process and distribution of compressive forces on the wheels. Testing of the hydraulic brake system with servo mechanism. Bench testing of pneumatic brakes. Determination of the influence of basic factors on the ESP system at the measurement stand. Approval procedures for the selected components of the vehicle.

4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	
Student's workload 1*	
Student's workload 2*	
Student's workload n*	
The other**	
Total hours:	**0**
Number of ECTS credits allocated to a course	**2**

Explanation:
* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation* and *report, doing written assignment, etc.*
** – the other e.g. *extra course hours*

5. Summary indexes:
   - number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students:
   - number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile:
   - number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies:
   - number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace:
6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

7. Detailed description of teaching modes:

8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

9. Method and procedure for making up for

10. Prerequisites and additional requirements, taking into account the course sequence:

11. Recommended sources and teaching aids:

12. Description of teachers' competences (e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

13. Other information: