Study plan

Name of study plan: 06 109 NSTI DLTT 2012 zaměření KV

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch: Program of study: Welcome page

Type of study: unknown Required credits: 432

Elective courses credits: -301 Sum of credits in the plan: 131

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 429

The role of the block: P

Code of the group: 12NS*1P-DLT-KV

Name of the group: 2012 NSTI 1.sem povinné DLTT - KV

Requirement credits in the group: In this group you have to gain 27 credits

Requirement courses in the group: In this group you have to complete 7 courses

Credits in the group: 27 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2142008	Microelectronics	KZ	2	2P+0C+1L	*	Р
2211131	Powertrains of Motor Vehicles 1	Z,ZK	5	3P+2C	*	Р
2213018	Principles of Design - Rail Vehicles	Z	2	2P+0C	*	Р

Characteristics of the courses of this group of Study Plan: Code=12NS*1P-DLT-KV Name=2012 NSTI 1.sem povinné DLTT - KV

2142008	Microelectronics	KZ	2			
Basic characteristics of	Basic characteristics of logic circuits and programmable logical systems, input and output circuits - voltage and current matching, D/A and A/D converters, coding, lines and protoc					
of communications, elec	of communications, electronic and optoelectronic parts for microelectronics, microprocessor system applications.					
2211131	Powertrains of Motor Vehicles 1	Z,ZK	5			
The subject clarifies the	The subject clarifies the design and basic calculations of aggregates of mechanical powertrains of passenger cars, trucks and motorcycles.					
2213018	Principles of Design - Rail Vehicles	Z	2			
Basic terminology and nomenclature of rail vehicles parts. Principles of railway vehicles components.						

Code of the group: 12NS*2P-DLT-KV

Name of the group: 2012 NSTI 2.sem povinné DLTT - KV

Requirement credits in the group: In this group you have to gain 30 credits

Requirement courses in the group: In this group you have to complete 6 courses

Credits in the group: 30

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2311074	Vibrations of Mechanical Systems Václav Bauma	ZK	4	3P+0C	*	Р
2211132	Powertrains of Motor Vehicles 2	Z,ZK	5	3P+2C	*	Р
2211050	Internal Combustion Engines Fundamentals	Z,ZK	6	4P+2C	*	Р
2211054	Theory of Vehicles Jan Kalivoda, Jiří Pakosta Jan Kalivoda Jan Kalivoda (Gar.)	Z,ZK	6	4P+2C	*	Р

Characteristics of the courses of this group of Study Plan: Code=12NS*2P-DLT-KV Name=2012 NSTI 2.sem povinné DLTT - KV

Onaraotoriotico c	The courses of this group of clady Flam Code=12116 21 D21 117 Hame=2012 11611 216011	POVIIIIO BEI 1	
2311074	Vibrations of Mechanical Systems	ZK	4
2211132	Powertrains of Motor Vehicles 2	Z,ZK	5
The subject clarifies th	e design and basic calculations of automatic aggregates of powertrains of passenger cars, trucks and motorcycles. 1 - Hydro	dynamic transmiss	sions 2 - Single
planetary sets (JPS) -	introduction, graphical method 3 - JPS - kinematics, torques, efficiency 4 - JPS - calculation of JATCO 40 transmission 5 - Ne	ested planetary gea	ar sets (SPS) -
graphical and analytic	al method 6 - Nested planetary gear set (SPS) - matrix method 7 - SPS - example calculation, conditions of assembly 8 - Pla	netary gearboxes -	calculation of
basic elements 9 - Var	ators (CVT) 10 - Powersplit transmissions, IVT 11 - Differential, behavior when driving in a curve, efficiency 12 - Differential v	vith more degree o	of freedom 13 -
Hydrostatic transmissi	ons 14 - Powertrains of hybrid vehicles		
2211050	Internal Combustion Engines Fundamentals	Z,ZK	6
Fundamentals of inter	nal combustion engines (ICE): principles of performance, combustion processes, flame types, formation of pollutants, gas exc	hange, super- and	l turbo-charging
description of tools for	fuel injection, mixture formation, valve gears, combustion realization, exhaust aftertreatment, lubrication and cooling. Engine	maps and testing	
2211054	Theory of Vehicles	Z,ZK	6
Description of theoreti	real sources for longitudinal vertical and directional dynamics of vehicles. Detailed description of interactions between road (r	ilway) and hody F	specially from

Code of the group: 12NS*3P-DLT-KV

view point of transmission of longitudinal and lateral forces and stability.

Name of the group: 2012 NSTI 3.sem povinné DLTT - KV

Requirement credits in the group: In this group you have to gain 32 credits

Requirement courses in the group: In this group you have to complete 6 courses

Credits in the group: 32 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2211146	Drives of Railway Vehicles Josef Kolář Josef Kolář (Gar.)	Z,ZK	4	3P+1C	*	Р
2211145	Railway Rolling Stock Running Gears Tomáš Heptner Tomáš Heptner (Gar.)	Z,ZK	5	4P+1C	*	Р
2311078	Controlled Mechanical Systems Václav Bauma, Zdeněk Neusser, Pavel Steinbauer, Zbyněk Šika, Michael Valášek Michael Valášek Michael Valášek (Gar.)	Z,ZK	4	3P+1C	*	Р
2211058	Computational Methods of Transport Machinery Jan Kalivoda, Ladislav Rus, Radek Tichánek, Michal Vašíček Jan Kalivoda Jan Kalivoda (Gar.)	Z,ZK	5	3P+2C	*	Р

Characteristics of the courses of this group of Study Plan: Code=12NS*3P-DLT-KV Name=2012 NSTI 3.sem povinné DLTT - KV

2211146	Drives of Railway Vehicles	Z,ZK	4			
Basic design of drive of	Basic design of drive concepts for railway vehicles and their influences on adhesion and driving properties					
2211145	Railway Rolling Stock Running Gears	Z,ZK	5			
Concepts of rail vehicle	e running gears. Basic theory, concepts and design of related subsystems					
2311078	Controlled Mechanical Systems	Z,ZK	4			
2211058	Computational Methods of Transport Machinery	Z,ZK	5			

Methods for both analysis and synthesis of 3D mechanisms. Computation of elastic joining components. Effects of non-linearities. Development of both mechanical and mathematical models of vehicles. Basic usage of FEM. Local and global coordinate system, matrices of mass, stiffness and damping. Both explicit and implicit solver. Models of materials. Torsional vibration in combustion engines and transmissions, methods of computation. Measurement of torsional vibration. Engine valve train (both kinematics and dynamics). Engine balancing

Code of the group: 12NS*4P-DLT-KV

Name of the group: 2012 NSTI 4.sem povinné DLTT - KV

Requirement credits in the group: In this group you have to gain at least 340 credits (at most 34)

Requirement courses in the group: In this group you have to complete 8 courses

Credits in the group: 340

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2141126	Rail Vehicles Electrical Equipment	Z,ZK	2	2P+0C+1L	*	Р
2211052	Design of Railway Vehicles Josef Kolář	ZK	4	4P+0C	*	Р
2212020	Accesories of Railway Vehicles Josef Kolář	KZ	2	3P+0C	*	Р
2383062	Budget and Project Economic Assessment	Z	2	1P+2C	*	Р
2213012	Manufacturing technology of Railway Vehicles Josef Kolář	Z	2	2P+0C	*	Р
2211043	Computational Methods and Testing of Ralway Vehicles Jan Kalivoda	Z,ZK	4	3P+1C	*	Р

Characteristics of the courses of this group of Study Plan: Code=12NS*4P-DLT-KV Name=2012 NSTI 4.sem povinné DLTT - KV 2141126 Rail Vehicles Electrical Equipment Equation of motion and mechanical properties of electrical drive, losses and dimensioning of electrical drive, general properties and control of DC drives, general properties and control of drives with asynchronous and synchronous motors, using of semiconductor converters in electrical drives, choppers, inverters, frequency converters, thyristor rectifiers, feedback control of electrical drive, EMC of electrical drive 2211052 Design of Railway Vehicles Basic concepts of railway vehicles design, design of railway vehicles body, chassis, underframe, running gear, auxiliary equipment, heating, ventilation and air conditioning plant. Accesories of Railway Vehicles ΚZ 2 Deepening the knowledge of designing accesories of Railway Vehiles and interiors of passager coach and dieselelectric oder electrics units, trams and subway cars 2 2383062 **Budget and Project Economic Assessment** The goal of the course is to improve the knowledge gained within the basic bachelor's degree course Management and Economics of the Enterprise. The course focuses primarily on deepening of basic knowledge and skills in the creation and evaluation of the operational budget, proper preparation and evaluation of costing model for manufactured products and the economic evaluation of an investment project, as it corresponds to contemporary knowledge and the development of management methods and techniques. Students specify a simple fictional industrial or engineering company or its sub-section (preferably inspired by their practical experience, internships or training program in real company). The first student's task is to prepare a detailed plan and budget of a project (e.g. new product development, product or process innovation, etc.) focused on improvement of profitability, competitiveness or effectiveness of the company. The second task is cost calculation for chosen calculation unit. Last task within this course is the evaluation of economical effectiveness of the project described within the first task. The dynamic methods like Net Present Value (NPV), Internal Rate of Return (IRR) or Discounted Payback Period (DPP) are used for this evaluation. The quality of realization and presentation of the task's outputs together with the results of the test decides on granting / denial of credit. Manufacturing technology of Railway Vehicles 2213012 2 Getting to know the different stages of the production cycle of Rail Vehicles. Basic understanding of the technology of Rail Vehicles and their components 2211043 Computational Methods and Testing of Ralway Vehicles Z,ZK 4 Calculation of running stability of a railway vehicle. Optimization of damping and suspension of the vehicle. Calculation of stable areas of lateral oscillation. Construction of mathematical models of railway vehicles with multiple degrees of freedom excited by unevenness of the track of harmonic run. Non-linear parts of suspension and damping. Calculation of force-feedbacks and acceleration, on the bogie and the body of the vehicle, according to harmonic excitation. Random process theory considering the random excitation of railway vehicles. Calculation of correlation functions, cross-correlation functions and power spectral density. Construction of mathematical models of railway vehicles in 3D. Calculation of feedbacks of 3D models on random excitation. Mass-continuum oscillation. Bending oscillation of the body of the vehicle. Name of the block: Compulsory elective courses

Minimal number of credits of the block: 3

The role of the block: PV

Code of the group: 12N**3Q--JV

Name of the group: 2012 N 3.sem povinná jazyková výuka

Requirement credits in the group: In this group you have to gain 2 credits

Requirement courses in the group: In this group you have to complete 1 course

Credits in the group: 2 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2043081	English - Preparatory Course / FME Veronika Kratochvilová	Z	2	0P+2C	*	PV
2043086	Czech - Preparatory Course Petr Laurich, Hana Volejníková	Z	2	0P+2C	*	PV
2043083	French - Preparatory Course / FME Dušana Jirovská Michaela Schusová Dušana Jirovská (Gar.)	Z	2	0P+2C	*	PV
2043082	German - Lower Intermediate Course Petr Laurich, Jaroslava Kommová, Eliška Vítková Jaroslava Kommová Jaroslava Kommová (Gar.)	Z	2	0P+2C	*	PV
2043085	Russian - Preparatory Course / FME Hana Volejníková, Dušana Jirovská Eliška Vítková	Z	2	0P+2C	*	PV
2043084	Spanish - Preparatory Course / FME Jaime Andrés Villagómez Eliška Vítková	Z	2	0P+2C	*	PV

Characteristics of the courses of this group of Study Plan: Code-12N**30--IV Name-2012 N 3 sem povinná jazyková výuka

nai acteristics (of the courses of this group of Study Plant. Code=12N 3Q5V Name=2012 N 3.sem povinila	jazykova vyt	ına
2043081	English - Preparatory Course / FME	Z	2
Aim: Understanding o	clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about the	m. Writing in a sir	nple way about
amiliar topics. Readir	ng and comprehension of simple texts. Improvement of professional language. European level A1 - A2.		
2043086	Czech - Preparatory Course	Z	2
Aim: Understanding o	elearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about the	em. Writing in a sir	nple way about
amiliar topics. Readir	ng and comprehension of simple texts. Improvement of professional language.		
2043083	French - Preparatory Course / FME	Z	2
Aim: Understanding o	elearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about the	m. Writing in a sir	nple way about
amiliar topics. Readir	ng and comprehension of simple texts. Improvement of professional language.		
2043082	German - Lower Intermediate Course	Z	2
Mapped to the level o	f Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations whic	ch a student meet	s either in the
company or in his/her	free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Impr	ovement of profes	sional languag

2043085 Russian - Preparatory Course / FME Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language. 2043084 Spanish - Preparatory Course / FME

Aim: Understanding clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement of professional language.

Code of the group: 12N**3Q--JZ

Name of the group: 2012 N 3.sem povinná jazyková zkouška

Requirement credits in the group: In this group you have to gain 1 credit

Requirement courses in the group: In this group you have to complete 1 course

Credits in the group: 1 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2041081	English - Master Exam Veronika Kratochvílová, Hana Volejníková, Ilona Šimice, Michaela Schusová, Michele Le Blanc Ilona Šimice (Gar.)	ZK	1	0P+0C	*	PV
2041086	Czech- Master Exam Petr Laurich, Hana Volejníková	ZK	1	0P+0C	*	PV
2041083	French - Master Exam / FME Dušana Jirovská Dušana Jirovská (Gar.)	ZK	1	0P+0C	*	PV
2041082	German - Master Exam / FME Petr Laurich, Jaroslava Kommová, Eliška Vítková Jaroslava Kommová Jaroslava Kommová (Gar.)	ZK	1	0P+0C	*	PV
2041085	Russian - Master Exam / FME Hana Volejníková, Dušana Jirovská Eliška Vítková	ZK	1	0P+0C	*	PV
2041084	Spanish - Master Exam / FME Jaime Andrés Villagómez Eliška Vítková Jaime Andrés Villagómez (Gar.)	ZK	1	0P+0C	*	PV

Characteristics of the courses of this group of Study Plan: Code=12N**3QJZ Name=2012 N 3.sem povinná jazyková zkouška						
2041081	English - Master Exam	ZK	1			
Mapped to the level of 0	common European Framework of Reference: A2. Aim: Understanding clearly what is spoken about everyday situations which	a student meets	at school or in			
his/her free time and sp	eaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement	of professional lan	guage.			
2041086	Czech- Master Exam	ZK	1			
2041083	French - Master Exam / FME	ZK	1			
Mapped to the level of 0	ommon European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations whic	h a student meets	either at school			
or in his/her free time a	nd speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improveme	nt of professional	language.			
2041082	German - Master Exam / FME	ZK	1			
Mapped to the level of C	common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations whic	h a student meets	either at school			
or in his/her free time a	nd speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improveme	nt of professional	language.			
2041085	Russian - Master Exam / FME	ZK	1			
Mapped to the level of 0	ommon European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations whic	h a student meets	either at school			
or in his/her free time a	nd speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improveme	nt of professional	language.			
2041084	Spanish - Master Exam / FME	ZK	1			
Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school						
or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.						

List of courses of this pass:

Code	Name of the course	Completion	Credits			
2041081	English - Master Exam	ZK	1			
Mapped to the lev	el of Common European Framework of Reference: A2. Aim: Understanding clearly what is spoken about everyday situations which a	student meets at s	chool or in			
his/her free tim	ne and speaking about them. Writing in a simple way about familiar topics. Reading and comprehension of simple texts. Improvement	of professional lan	guage.			
2041082	German - Master Exam / FME	ZK	1			
Mapped to the leve	l of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a	student meets eith	er at school			
or in his/her free	e time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvemen	nt of professional la	ınguage.			
2041083	French - Master Exam / FME	ZK	1			
Mapped to the leve	l of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a	student meets eith	er at school			
or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.						
2041084	Spanish - Master Exam / FME	ZK	1			
Mapped to the leve	Mapped to the level of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a student meets either at school					
or in his/her free	or in his/her free time and speaking about them. Writing in a simple way about familiar topics. reading and comprehesion of simple texts. Improvement of professional language.					

2041085	Russian - Master Exam / FME I of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a s	ZK	1
	e time and speaking about them. Writing in a simple way about familiar topics, reading and comprehesion of simple texts. Improvement		
2041086	Czech- Master Exam	ZK	1
2043081		Z	2
	English - Preparatory Course / FME g clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. V	_	_
din. Onderstandin	familiar topics. Reading and comprehension of simple texts. Improvement of professional language. European level A1 - A2.		way abo
2043082	German - Lower Intermediate Course	Z	2
	rel of Common European Framework of Reference A2 Aim: Understanding clearly spoken language about everyday situations which a		1
	er free time and speaking about them. Writing in a simple way about familiar topics, reading and comprehesion of simple texts. Improvem		
2043083	French - Preparatory Course / FME	7	2
	g clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. V	∠ Writing in a simple	_
um. Onderstandin	familiar topics. Reading and comprehension of simple texts. Improvement of professional language.	witting in a simple	way abo
2043084	Spanish - Preparatory Course / FME	Z	2
	g clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. V	-	. –
01.401014.1411	familiar topics. Reading and comprehension of simple texts. Improvement of professional language.	g a cp	, iiu, uoo
2043085	Russian - Preparatory Course / FME	Z	2
	g clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. V		1
	familiar topics. Reading and comprehension of simple texts. Improvement of professional language.	gp	,
2043086	Czech - Preparatory Course	Z	2
	g clearly what is spoken about everyday situations which a student meets at school or in his/her free time and speaking about them. V	-	1
	familiar topics. Reading and comprehension of simple texts. Improvement of professional language.		, a
2141126	Rail Vehicles Electrical Equipment	Z.ZK	2
	and mechanical properties of electrical drive, losses and dimensioning of electrical drive, general properties and control of DC drives, g	,	. –
3	nchronous and synchronous motors, using of semiconductor converters in electrical drives, choppers, inverters, frequency converters,		
-	control of electrical drive, EMC of electrical drive	-	
2142008	Microelectronics	KZ	2
	s of logic circuits and programmable logical systems, input and output circuits - voltage and current matching, D/A and A/D converter	s, coding, lines a	nd protoc
	of communications, electronic and optoelectronic parts for microelectronics, microprocessor system applications.	_	-
2211043	Computational Methods and Testing of Ralway Vehicles	Z,ZK	4
	ing stability of a railway vehicle. Optimization of damping and suspension of the vehicle. Calculation of stable areas of lateral oscillation.	,	nathematic
odels of railway ve	chicles with multiple degrees of freedom excited by unevenness of the track of harmonic run. Non-linear parts of suspension and damping.	Calculation of ford	e-feedbac
•	n the bogie and the body of the vehicle, according to harmonic excitation. Random process theory considering the random excitation o		
	if the boyle and the body of the verticle, according to narmonic excitation. Handom process theory considering the random excitation o		
		-	
of correlation funct	ions, cross-correlation functions and power spectral density. Construction of mathematical models of railway vehicles in 3D. Calculation	-	
	ions, cross-correlation functions and power spectral density. Construction of mathematical models of railway vehicles in 3D. Calculatio on random excitation. Mass-continuum oscillation. Bending oscillation of the body of the vehicle.	n of feedbacks o	f 3D mode
2211050	ions, cross-correlation functions and power spectral density. Construction of mathematical models of railway vehicles in 3D. Calculatio on random excitation. Mass-continuum oscillation. Bending oscillation of the body of the vehicle. Internal Combustion Engines Fundamentals	z,ZK	f 3D mode
2211050 undamentals of in	tions, cross-correlation functions and power spectral density. Construction of mathematical models of railway vehicles in 3D. Calculation on random excitation. Mass-continuum oscillation. Bending oscillation of the body of the vehicle. Internal Combustion Engines Fundamentals Iternal combustion engines (ICE): principles of performance, combustion processes, flame types, formation of pollutants, gas exchanged.	Z,ZK e, super- and tur	f 3D mode
2211050 undamentals of in description	tions, cross-correlation functions and power spectral density. Construction of mathematical models of railway vehicles in 3D. Calculation on random excitation. Mass-continuum oscillation. Bending oscillation of the body of the vehicle. Internal Combustion Engines Fundamentals Iternal combustion engines (ICE): principles of performance, combustion processes, flame types, formation of pollutants, gas exchanged to tools for fuel injection, mixture formation, valve gears, combustion realization, exhaust aftertreatment, lubrication and cooling. Engineers	Z,ZK e, super- and turine maps and tes	f 3D mode 6 bo-chargir
2211050 undamentals of in description 2211052	ions, cross-correlation functions and power spectral density. Construction of mathematical models of railway vehicles in 3D. Calculation on random excitation. Mass-continuum oscillation. Bending oscillation of the body of the vehicle. Internal Combustion Engines Fundamentals Iternal combustion engines (ICE): principles of performance, combustion processes, flame types, formation of pollutants, gas exchange of tools for fuel injection, mixture formation, valve gears, combustion realization, exhaust aftertreatment, lubrication and cooling. Engineering Design of Railway Vehicles	Z,ZK e, super- and turine maps and tes	f 3D mode 6 bo-chargir ting 4
2211050 undamentals of in description 2211052 Basic concepts of	ions, cross-correlation functions and power spectral density. Construction of mathematical models of railway vehicles in 3D. Calculatio on random excitation. Mass-continuum oscillation. Bending oscillation of the body of the vehicle. Internal Combustion Engines Fundamentals Internal combustion engines (ICE): principles of performance, combustion processes, flame types, formation of pollutants, gas exchang of tools for fuel injection, mixture formation, valve gears, combustion realization, exhaust aftertreatment, lubrication and cooling. Enging Design of Railway Vehicles of railway vehicles design, design of railway vehicles body, chassis, underframe, running gear, auxiliary equipment, heating, ventilation	Z,ZK e, super- and tur ine maps and tes ZK a and air condition	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
2211050 undamentals of in description 2211052 Basic concepts of 2211054	ions, cross-correlation functions and power spectral density. Construction of mathematical models of railway vehicles in 3D. Calculation on random excitation. Mass-continuum oscillation. Bending oscillation of the body of the vehicle. Internal Combustion Engines Fundamentals Internal combustion engines (ICE): principles of performance, combustion processes, flame types, formation of pollutants, gas exchange of tools for fuel injection, mixture formation, valve gears, combustion realization, exhaust aftertreatment, lubrication and cooling. Enging Design of Railway Vehicles of railway vehicles design, design of railway vehicles body, chassis, underframe, running gear, auxiliary equipment, heating, ventilation Theory of Vehicles	Z,ZK e, super- and tur ine maps and tes ZK a and air condition Z,ZK	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
2211050 undamentals of in description 2211052 Basic concepts of 2211054	ions, cross-correlation functions and power spectral density. Construction of mathematical models of railway vehicles in 3D. Calculation on random excitation. Mass-continuum oscillation. Bending oscillation of the body of the vehicle. Internal Combustion Engines Fundamentals Internal combustion engines (ICE): principles of performance, combustion processes, flame types, formation of pollutants, gas exchange of tools for fuel injection, mixture formation, valve gears, combustion realization, exhaust aftertreatment, lubrication and cooling. Enging Design of Railway Vehicles Of railway vehicles design, design of railway vehicles body, chassis, underframe, running gear, auxiliary equipment, heating, ventilation Theory of Vehicles Orteital sources for longitudinal, vertical and directional dynamics of vehicles. Detailed description of interactions between road (railway)	Z,ZK e, super- and tur ine maps and tes ZK a and air condition Z,ZK	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
2211050 undamentals of in description 2211052 Basic concepts of 2211054 Description of theo	Internal Combustion Engines Fundamentals Internal Combustion of Interaction Internation I	Z,ZK e, super- and turine maps and tes ZK a and air condition Z,ZK y) and body. Esp	f 3D mode 6 bo-chargin ting 4 ning plant. 6 ecially from
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the economic evaluation of an investment project, as it corresponds to contemporary knowledge and the development of management methods and techniques. Students specify a simple fictional industrial or engineering company or its sub-section (preferably inspired by their practical experience, internships or training program in real company). The first student's task is to prepare a detailed plan and budget of a project (e.g. new product development, product or process innovation, etc.) focused on improvement of profitability, competitiveness or effectiveness of the company. The second task is cost calculation for chosen calculation unit. Last task within this course is the evaluation of economical effectiveness of the project described within the first task. The dynamic methods like Net Present Value (NPV), Internal Rate of Return (IRR) or Discounted Payback Period (DPP) are used for this evaluation.

The quality of realization and presentation of the task's outputs together with the results of the test decides on granting / denial of credit.

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