

APPROVED BY

Vice-Rector for Academic and International
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Double Degree Master Program in Engineering Science (DDMPES)

Module Catalogue

The DDMPES shall consist of the following categories:

- at least 18 credits advanced mathematical courses
- at least 54 credits in two strong points listed below. In particular
- at least 24 credits in one of the strong points listed below
- at least 24 credits in the second one of the strong points listed below
- furthermore, at least 24 credits should be from the core areas of both strong points
- at least 6 credits from the group of “projects”
- at least 24 elective credits. In particular,
- at least 9 credits in technical subjects
- at least 9 credits in non-technical subjects
- Master thesis (18 credits at TUB and 24 credits at TPU).

Advanced language courses may be chosen to fulfill 12 non-technical elective credits.

The list of the strong points:

- numerics and simulation
- fluid dynamics
- mechatronics
- solid state mechanics
- thermodynamics
- technical acoustics

2 strong points are to be chosen.

Module group:	Assigned modules	ECTS credits
Mathematical methods		18
Modules in Berlin		
	Fundamentals of Continuum Theory I	6
	Fundamentals of Continuum Theory II	6
	Numerics II for Engineers	10
	Variational Calculus and Optimal Control	5
	Stochastics for Computer Scientists	6
	Analysis III	6
Modules in Tomsk		

	Optimization Problems Special Course in Mathematics	10
Module Catalogue of the Strong Points		
Numerics and simulation	Assigned modules	ECTS credits
<i>Modules in Berlin</i>		
Core area (level 1)*		
	Basic Principles of Computational Fluid Dynamics (CDF1)	6
	Applied Computational Fluid Dynamics (CFD2)	6
	Applied Information Technology	6
	Principles of Industrial Information Technology	6
	Project Simulationtools and their Application	6
	Structural Dynamic	6
	Numeric II for Engineering	10
	Numerical Simulation Methods in Engineering	6
advanced courses (level 2)**		
	Analysis and Simulation of Machine Tool and Process	6
	Transport Modeling and Simulation	6
	Multi-agent Ttransport Simulation	6
	Applied Computational Fluid Dynamics	6
	Computational Aeroacoustics and its Applications	6
	Computational Fluid Dynamics for maritime Systems	6
	Computer Aided Design of Marine Systems (CAD MS)	6
	Simulation in Automotive Engineering	6
	Modeling and Simulation of Turbulent Flows	6
	Picture Producing Process in Medicine and Neurobiology	6
	Control Theory	5
	Methods of Construction informatics	9
	Object Oriented Software Development	6
	Project "Finite Element Methods"	6
<i>Modules in Tomsk</i>		
	Mathematical Methods in Engineering	6
	Computer Technologies in Science and Education	6
	Systems Analysis, Simulation and Optimization in Engineering	6
	Mathematical Methods of Experimental Data Proceession	4
	Molecular Dynamics and Mesoparticle Methods in Physics and Engineering	10
	Dimensional Analysis of Product Design	6
Fluid dynamics	Assigned modules	ECTS credits
<i>Modules in Berlin</i>		
Core area (level 1)*		
	Advanced Fluid Dynamics	6

		Turbulence and Flow control I	6
		Turbulence and Flow control II	6
		Gasdynamics I	6
		Gasdynamics II	6
		Measurement Techniques in Fluid Dynamics I	6
		Measurement Techniques in Fluid Dynamics II	6
		Aerodynamics I	6
		Aerodynamics II	6
		Fundamentals of Aeroacoustics	6
		Fluidmechanics - Technical Samples	6
		Flow around Automobiles and Buildings	6
advanced courses (level 2)**			
		Turbo Machinery Noise	6
		Aerothermodynamics II	9
		Applied Aeroacoustics	6
		Aerodynamics Lab I	6
		Fluid System Dynamics- Operation	6
		Gas Turbines and Thermoacoustic	6
		Methods of Flow Control for Sailing Yachts	6
		Reduced-order Modeling and Control of Turbulent Flow I	6
		Low-dimensional Modeling and Control of Turbulent Flow II	6
		Applied Computational Fluid Dynamics (CFDe)	6
		Numerical Simulation Methods in Engineering	6
		Thermo- and Turbomachinery-Acoustics	6
		Basic Principles of Computational Fluid Dynamics (CFD1)	6
		Applied Computational Fluid Dynamics (CFD2)	6
		Ship Hydrodynamics I	6
		Ship Hydrodynamics II	6
		Flow Control: Low Dimensional Modeling and Cybernetics of Instationary Flows	3
		Flow Control: Physical Principles and Technical Applications	6
		Flow Control: Feedback Control Design and Model Reduction	6
		Fluid Flowmachine - Design	6
		Fluid Flowmachine - Components	6
		Fluid Mechanics in Medicine	6
		Basics of Turbomachinery I	6
		Turbomachinery II - Aerodynamics of Turbomachinery	6
		Modeling and Simulation of Turbulent Flows	6
Modules in Tomsk			
		Multicomponent Nanostructured Coatings with Special Properties	4
		Automation and Control of Vacuum Equipment	4
		Technology Science Intensive Engineering Industries	8
		Technology of Special Alloys Production	4
Mechatronics		Assigned modules	Credits (according to ECTS)
Modules in Berlin			

Core area (level 1)*		
	Elements of Mechatronics	6
	Embedded Operating Systems	6
	Measurement and Control	9
	Electric Drives	6
	Control II	8
	Mechatronics and System Dynamics	6
	Vibration Measurement	6
	Mechanics Vibration Theory and Machine Dynamics	6
advanced courses (level 2)**		
	Analog and Digital Electronics	6
	Automation Engineering	6
	Image Based Automation I	6
	Digital Electronics and Programming of Microcontrollers	6
	Power Electronics	9
	Oilhydraulic Drives and Control Systems	6
	Photonics	6
	Robotics	6
	Mechatronics in Industrial Applications	3
	Simulation I	6
	System Dynamics in Industrial Applications	3
	Measurement of Vibrations	2
	Vibration Isolation and Vibration Impact	6
Modules in Tomsk		
	Dimensional Analysis of Product Design	6
	Automation and Control of Vacuum Equipment	4
Solid State Mechanics	Assigned modules	Credits (according to ECTS)
Modules in Berlin		
Core area (level 1)*		
	Analytical Mechanics	6
	Flight Mechanics 2 (Flight dynamics)	6
	Fundamentals of Continuum Theory I	6
	Contact Mechanics and Friction Physics	6
	Structure-borne Sound (TA 5)	6
	Rotor Dynamics	6
	Structural Mechanics II	6
	Introduction into the Vehicle Dynamics / Dynamics of Rail Vehicles	6
	Mechanical Vibration Theory and Machine Dynamics	6
advanced courses (level 2)**		
		6
	Elasticity and Plasticity I	6
	Elasticity and Plasticity II	6
	Materials Science	6

	Advanced Structure-Borne Sound (TA 9)	6
	Mechatronics in Industrial Applications	3
	Mechatronics und System Dynamics	6
	Project Rolling Wheel on Soft Soil (Terra mechanics)	6
	Project Elasticity and Fracture Mechanics	6
	Project Friction Physics	6
	Project for the Finite Element Method	6
	Vibration Isolation and Vibration Impact	6
	Aeroelastics	6
	Non-linear and Chaotic Vibrations	6
	Vibration Analysis of Elastic Continua	6
	Structural Dynamics	6
	System Dynamics in Industrial Applications	3
	Composite Materials and Composite Structures: Theory and Application	6
	Numerical Simulation Methods in Engineering	6
	Modules in Tomsk	
	Thermal Physics of High-Temperature Technology in Engineering	8
	Automation and Control of Vacuum Equipment	4
	Methodology and Equipment of Experimental Investigations in Mechanical Engineering	6
	Basics of Research, Organization and Planning of The Experiment	6
	New Structural Materials	4
	Special Chapters of Strength	6
	Multicomponent Nanostructured Coatings with Special Properties	4
	Technology Science Intensive Engineering Industries	8
	Technology of Special Alloys Production	4
	Fundamentals of Tribology	6
	Technology for Producing Nanostructured and Nanoscale Materials	4
Thermodynamics	Assigned modules	Credits (according to ECTS)
	Modules in Berlin	
	Core area (level 1)*	
	Application of Thermodynamics	6
	Energy, Momentum and Mass Transfer A-I	7
	Plant and Safety Technology	4
	Basic Principles of Computational Fluid Dynamics (CFD1)	6
	Applied Computational Fluid Dynamics (CFD2)	6
	Statistical Thermodynamics	6
	Thermal Unit Operations (TGO)	6
	Thermodynamics II	7
	advanced courses (level 2)**	
	Energy Technology I	6
	Aerothermodynamics II	9
	Gas Turbines and Thermoacoustic	6
	Measurement and Control	9
	Irreversible Thermodynamics	6

	Materials Science	6
	Polymer Thermodynamics	6
	Thermodynamic Constitutive Theory	6
	Low-Temperature Thermodynamics	6
	Gasdynamics I	6
	Gasdynamics II	6
	Conversion Technologies for Renewable Energies	5
	Combustion	6
	Process and Plant Dynamics	6
	Modules in Tomsk	
	Thermal Physics of High-temperature Technology in Engineering	8
	Technology for Producing Nanostructured and Nanoscale Materials	4
	Multicomponent Nanostructured Coatings with Special Properties	4
	Technology of Special Alloys Production	4
	New Structural Materials	4
	Technical Acoustics	Assigned modules
		Credits (according to ECTS)
	Modules in Berlin	
	Core area (level 1)*	
	Fluid-Borne Sound - Basics (TA 1 PI)	9
	Noise and Vibration Control (TA 2 PI)	9
	Measurement Technique and Signal Processing (TA 4)	6
	Structure-Borne Sound (TA 5)	6
	Fundamentals of Aeroacoustics	6
	Vibration Isolation and Vibration Control	6
	Mechanical Vibration Theory and Machine Dynamics6	
	advanced courses (level 2)**	
	Gas Turbines and Thermoacoustic	6
	Applied Aeroacoustics	6
	Advanced Noise and Vibration Control (TA 6 PI, TA 4 MB)	9
	Thermo- and Turbomachinery-Acoustics	6
	Advanced Structure-borne Sound (TA 9)	6
	Noise Impact Assessment, Soundscapes, Noise Protection in Urban Planning (TA 3b)	6
	Advanced Fluid-borne Sound (TA 7, TA 3 MB)	6
	Computational Aeroacoustics and its Applications (CAA)	6
	Psychoacoustics (TA 3a)	6
	Theoretical Acoustics (TA 8)	6
	Statistical Energy Analysis (TA 10)	6
	Non-linear and Chaotic Vibrations	6
	Aeroengines and the Environment	6
	Modules in Tomsk	
	Fundamentals of Tribology	6
	Methodology and Equipment of Experimental Investigations in Mechanical	6

	Engineering	
	Special Chapters of Strength	6
Project	Aerothermodynamics II	9
	Application of thermodynamics	6
	Project Aerodynamics II	9
	Fluid System Dynamics - Project	6
	Innovation Workshop	6
	Measurement Techniques in Fluid Dynamics I	6
	Measurement Techniques in Fluid Dynamics II	6
	Applied Computational Fluid Dynamics (CFDe)	6
	Computational Fluid Dynamics - Scientific Development	6
	Project Actuators and Sensors / Master	6
	Project Friction Physics	6
	Project Structural Dynamics	6
	Project for the Finite Element Method	6
	Wind Energy - Project/Advanced	6
Nontechnical subjects:		
In Berlin:	Free selection from the whole study program of German universities	
Modules in Tomsk		
	Philosophy and Methodological Problems of Modern Science	3
	Foreign Business Language	4
	Management and Marketing	2
	Protecting Intellectual Property	3
	Modern Problems in Engineering	3

* **level 1** corresponds to the level 5 of TPU

****level 2** corresponds to the level 6 of TPU

Approved:

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