Double Degree Master Program in Engineering Science (DDMPES)

TU Berlin - ECUST Shanghai

Module Catalogue

The DDMPES shall consist of the following categories:

- 18 credits advanced mathematical courses
- 24 credits + project (6 credits) in one of the strong points listed below
- 24 credits + project (6 credits) in the second one of the strong points listed below
- 12 elective credits in technical subjects
- 12 elective credits in non technical subjects
- Master thesis (18 credits).

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.
In each strong point, at least 24 credit points from advanced level 2 should be chosen, further 6 credit points shall be completed as a project.

Module group:	Assigned modules	Credits (according to ECTS)
Mathematical methods		**18**
Modules in Berlin		
	Tensor Analysis and Continuum Physics	6
	Numerics II for Engineers	6
or	Finite-Element-Method in Mechanics I	6
	Measurement and Control	
	Control Theory	9
	Variational Calculus and Optimal Control	5
	Stochastics for Computer Scientists	6
	Analysis III	6
	Integral Transformations and Partial Differential Equations	6
	Numerics I for Engineers	6
Modules in Shanghai		
	Matrix theory (006M0701001006)	4
	Wavelet analysis (006M0701001008)	3

	Mathematical modeling (006M0701001010)	3
	Optimization methods (006M0701001002)	3

Module Catalogue of the Strong Points

Numerics and simulation	**Assigned modules**	**Credits (according to ECTS)**
Modules in Berlin		
Core area (level 1)		
	Computational Fluid Dynamics CFD I+II	12
	Finite Element Methods 1	6
	Finite Element Methods 2	6
	Applied Information Technology	6
or	Industrial Information Technology	12
	Software Engineering	6
	Programming of Parallel and Distributed Systems	9
	Parallel Numerics	12
advanced courses (level 2)		
	CFD-Project (Applied Computational Fluid Dynamics (Project))	6
	Practical Training in Finite-Element-Method	6
	Seminar in Modeling	6
	Simulation and Measurement	12
	Numerical Linear Algebra	6
	Numerics of Elliptical Partial Differential Equations	6
	Statistical Turbulence Modeling	6
	Numerical Aeroacoustics (CAA)	12
	Technical Information Systems	6
	Information Systems Project	6
	OKS 1 - Basics (Fundamental Principles of Open Communication Systems)	6
and	OKS 3 - Practice (Advanced Communication Systems)	6
	OKS-Project (I or/and II)	6
	Fundamental Principles of Information Modeling	6
and	Databases (Database Systems)	6
	Picture Producing Process in Medicine and Neurobiology	6
	Algorithms of Image Processing	6
	Visualizing in Mathematics	10
	Picture Producing Process in Medicine I	6
	Industrial Image Processing	9
	Computer Graphics – Basics	6
	Computer Graphics – Completion	6
	Simulation of Production Systems - Work Place	
	Simulation of Production Systems - Material Flow	6

	Process and System Dynamics / Process Simulation	12
	Design and Simulation	12
	Numerical Simulation Methods in Engineering	6
	Communication Networks and Technology	12
	Modeling of Traffic Systems	8
	Modeling with Differential Equations I	10
	Control Theory	4
	Advanced Control Theory	9
	Neuronal Information Processing - Basics	9
	Neuronal Information Processing - Extension	9
	Linear Optimization	10
	Non-linear Optimization	10

Modules in Shanghai

	Numerical solution of differential equation (006D0701001003)	5
	Optimization methods (006M0701001002)	3
	Wavelet analysis (006M0701001008)	3
	CAD/CAM for industry (004M0802012008)	3
	Computer graphics (004M0802015022)	3
	3D graphics technology for engineering application (004M0802015023)	3
	Software design of measuring and control system (004M0802015026)	3
	Development of engineering software (004M0802015029)	3

Fluid dynamics	**Assigned modules**	**Credits (according to ECTS)**

Modules in Berlin

Core area (level 1)		
	Advanced Fluid Dynamics	6
	Turbulent Flows	12
	An Introduction to Computational Fluid Dynamics	12
	Fundamentals of Aeroacoustics	6
	Gasdynamics I	6
	Gasdynamics II	6
	Measurement Techniques in Fluid Dynamics	12
	Aerothermodynamics I	6
	Aerothermodynamics II	6
	Fluid System Dynamics	12
	Fluid Machinery	12
	Aerodynamics I	6
	Aerodynamics II	6
	Flow and Combustion in Gas Turbines	6
	Flow around Automobiles and Buildings	6
advanced courses (level 2)		
	Turbomachinery Noise	6
	Applied Computational Fluid Dynamics	6

	Modeling and Control of Combustion Systems: Thermal Acoustics	6
	Dimensional Analysis (Stability and Transition)	12
	Marine Hydrodynamics	12
	Process Engineering I	9
	Statistical Turbulence Modeling	6
	Computational Fluid Dynamics (CFD)	12
	Theoretical Acoustics (TA 8)	6
	Numerical Aeroacoustics (CAA)	6
	Supplement to Aeroacoustics	6
	Fluid-Borne Sound-Basics (TA 1 PI)	9
	Advanced Fluid-Borne Sound (TA 7)	6
	Flight Mechanics 2	6
	Numerical Simulation Methods in Engineering Science	6

Mechatronics	**Assigned modules**	**Credits (according to ECTS)**
Modules in Berlin		
Core area (level 1)		
	System Dynamics and Mechatronics	6
	Measurement and Control	12
	Measurement Technology	12
	Electric Drives	6
	Drive Systems and Components	12
	Precision Mechanics and Micro Technology	12
or	Analog and Digital	6
	Embedded Real-time Systems	6
	Robotics (PDV 3)	6
	Theoretical Electrical Engineering	6
advanced courses (level 2)		
	Mechatronics in Industrial Application	3
	Measurement and Control - Completion	9
	Optimization Based Planning and Realization of Dynamic Processes	6
	Oil Hydraulics and Pneumatics 1	6
	Oil Hydraulics and Pneumatics 2	6
	Industrial Image Processing	9
	PDV / Robotics - Project	9
	Artificial Intelligence: Basis and Application	6
	Vibration Influence and Vibration Isolation in Machines Systems	6
	Flight Controlling	6
	Kinematics of Machinery Systems	6
Modules in Shanghai		
	Mechatronics system design and analysis (004M0802013011)	3
	Basic theories of modern control (004M0802012013)	3
	Virtual machine technology and application (004M0802013014)	3
	Engineering measurement and signal processing (004M0802013015)	3

	Kinematics and dynamics of robots (004M0802013016)	3
	Tribology for engineering (004M0802013009)	3
	Modern design methods (004M0802012007)	3
	Monitoring and control theories & technology for mechanical manufacture procedure (004M0802013012)	3
	Sensor technology (004M0802015024)	3
	Software design of measuring and control system (004M0802015026)	3

Solid State Mechanics	**Assigned modules**	**Credits (according to ECTS)**

Modules in Berlin

Core area (level 1)		
	Contact Mechanics and Friction Physics	6
	Materials Science	6
	Mechanical Vibration Theory	6
	Finite Element Method - FEM I	6
	Finite Element Method - FEM II	6
	Fracture Mechanics I	6
	Fracture Mechanics II	6
	Project Finite Element Method	6
	Elasticity and Plasticity	6
	Vibration Influence and Vibration Isolation	6
	Dynamics of Power Train Systems	6
	System Dynamics and Mechatronics	6
	Introduction into the Vehicle Dynamics / Dynamics of Rail Vehicles	6
	Non-linear Continuum Mechanics	6
advanced courses (level 2)		
	Structure-Borne Sound (TA 5)	6
	Advanced Structure-Borne Sound (TA 9)	6
	Numerical Simulation Methods in Engineering Science	6
	Aeroelastics	6
	Non-linear and Chaotic Vibrations	6
	Rotor Dynamics	
	Flight Mechanics 2	6
	Flight Mechanics 3	6
	Contact Mechanics and Friction Physics	

Modules in Shanghai

	Tribology for engineering (004M0802013009)	3
	Surface engineering (004M0802015024)	3
	Vibration and cutting (004M0802015028)	3
	Modern design methods (004M0802012007)	3
	Wavelet analysis (006M0701001008)	3

Thermodynamics	**Assigned modules**	**Credits (according to ECTS)**

Modules in Berlin

Core area (level 1)		
	Irreversible Thermodynamics	
	Basic Thermic Operations	
	Theoretical Physics IV: Thermodynamics and Statistics	10
	Flow and Combustion in Gas Turbines	
	Combustion	
	Kinetic Theory	
	Statistical Physics	12
advanced courses (level 2)		
	Basics of Computational Fluid Dynamics (CFD 1+2)	
	Modeling and Control of Combustion Systems	6
	Low Temperature (Cryogenic) Thermodynamics	
	Phase Equilibrium in Multi-phase Systems	6
	Thermodynamics for Biological Systems	6
	Thermodynamics for Aggregating Systems	6
	Physical Chemistry III	
	Physical Chemistry IV	
	Gasdynamics I	
	Gasdynamics II	

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 in Machines Systems	6
advanced courses (level 2)		
	Advanced Fluid-Borne Sound (TA 7)	6
	Theoretical Acoustics (TA 8)	6
	Aerodynamic Sound (TA 11)	6
	Advanced Noise and Vibration Control (TA 6 PI)	9
	Advanced Structure-Born Sound (TA 9)	6
	Supplementing Aeroacoustics	6
	Numerical Aeroacoustics (CAA)	6
	Flow and Combustion in Gas Turbines	6
	Modeling and Control of Combustion Systems (Thermoacoustics II)	6
	Statistical Energy Analysis (TA 10)	6
	Non-linear and Chaotic Vibrations	6
	Psychoacoustics, Noise Effects and Urban Noise Protection (TA 3)	12
Project	Acoustic Project	6

Nontechnical subjects:		
In Berlin:	Free selection from the whole study program of German universities:	
Modules in Shanghai		
	Foreign Language (Chinese / German)	6
	Administration (012M1202019090)	2
	Market economy and laws (012M0202019038)	2