

Double Degree Master Program in Mechanical Engineering (DDMME)
TU Berlin - Tsinghua University (Beijing)
Module Catalogue

The DDMPME shall consist of the following categories:

- At least 18 credits advanced mathematical courses.
- At least 54 credits in two strong points, which have to be chosen from the list of six strong points listed below. From these 54 credits, at least 24 credits should be chosen from each of the strong points and at least 24 credits should be chosen from the "core area", defined in the module catalog (see attachment).
- At least 6 credits of the category "project".
- At least 24 elective credits (with at least 9 credits in technical subjects and at least 9 credits in non technical subjects).
- Master thesis (18 credits at TUB, regulation for THU see NOTICE below).

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

NOTICE. The following exception from the described structure can be accepted in the framework of a personal study plan approved by both universities: If the Master thesis is carried out at the THU, it is allowed to combine the 6 ETCS credits from category "project", 24 ECTS credits from the category "elective courses" and 18 ECTS credits from the category "Master thesis" to a single one year study and research work, which in this case will be counted with 48 ECTS credits.

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 Beijing		
	Numeric ananalysis A (60420044)	12
	High-level Numeric ananalysis (60420024)	12
	Applied stochastical process (60420094)	12

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 Beijing

Core area (level 1)

Finite Element Analysis and Its Applications (70120073)	9
---	---

advanced courses (level 2)

Computer Modeling and Simulation for Materials Processing (70120133)	9
Digital Simulation of Mechanical System (80120183)	9
Project Study of FEM Application (80120562)	6
Computer-Aided Tissue Engineering (CATE) (80120612)	6
Computer Numerical Control Technology (80120672)	6
Numerical Simulation of Manufacturing Processes (80120692)	6

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 Beijing

Core area (level 1)	
Mechatronic Intelligent Control Engineering (70120173)	9
Vibration Theory (70120213)	9
Modern CAD Technology (80120623)	9
Automatic control for Mechanic-electronic System (70120023)	9
Nondestructive Testing and Quality Control (70120043)	9
Advanced theory and methodology on mechanic design (80120633)	9
advanced courses (level 2)	
Advanced Manufacturing Technology (80120712)	6
Robots and Bionics (80120662)	6
Parallel Robot (70120192)	6
Modern Materials Processing (70120063)	10
Principle and practice for mechanical and electrical product design (70120163)	6
The Reconfiguration and Control for parallel robots (70120182)	6
CPLD/FPGA and design of modern electronic system (70120202)	6
Manufacturing Technology I (70120223)	9
Modern Welding (80120042)	6
Power Electronic Devices (80120053)	9
Modern Laser Processing of Materials (80120073)	9
Welding Technology I: Welding and Cutting Technologies (80120253)	9
Technology for failure diagnosis (80120522)	6
Introduction to Biomanufacturing Engineering (80120572)	6
Functional Materials (80120582)	6
Design and Experiments on Humanoid Soccer Robot (80120683)	9
Manufacturing Technology II (80120723)	9
Frontier of Manufacturing by Material Processing Technology (90120022x012xxx2)	6

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 Beijing

Principles of Tribology (80120643)	9
Test Methods and Analytical Techniques of Tribology (80120653)	9
Vibration Theory (70120213)	9
Elasticity and Plasticity (70120083)	9
Advanced Manufacturing Technology (80120712)	6
Modern CAD Technology (80120623)	9

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	

Modules in Beijing

Alloying Thermodynamics (80120542)	6
------------------------------------	---

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:

Modules in Berlin

Free selection from the whole study program of German universities:

Modules in Beijing

Scientific and Technical Colloquium (80120062)	6
English (60640012)	6
Chinese for foreigners	12
Selection from the whole study program of Tsinghua University	