Appendix A: Course Schedule

for the study programme Mechanical Engineering B.Eng.

Please note: The German version of this document is the legally binding version. The English translation provided here is for information purposes only.

Specialisation: Design and Development

First semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1053	Introduction to Mechanical Engineering	EMA	2	0	0	2	0	5
1091	Strength of Materials	FLE	2	2	0	0	0	5
1148	Mathematics 1	MA1	2	2	0	0	0	5
1248	Statics	STK	2	2	0	0	0	5
1265	Technical Drawing	TZ	2	1	1	0	0	5
1280	Materials Engineering	WT	2	1	0	1	0	5
							Total CP:	30
Second semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1048	Dynamics	DYN	2	2	0	0	0	5
1134	Plastics Technology	KT	2	1	0	1	0	5
1154	Mathematics 2	MA2	2	2	0	0	0	5
1087	Physics	PH	2	2	0	0	0	5
1267	Thermodynamics 1	TD1	2	2	0	0	0	5
1271	Connecting Elements	VBE	2	1	1	0	0	5
							Total CP:	30
Third semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1017	Basic Project	BP	1	3	0	0	0	5
1037	CAD	CAD	2	0	2	0	0	5
1096	Gearbox Elements	GTE	2	1	1	0	0	5
1159	Mathematics 3	MA3	2	2	0	0	0	5
1214	Production Engineering	PRT	2	2	0	0	0	5
1227	Process and Information Management	PIM	2	2	0	0	0	5
							Total CP:	30
Fourth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1054	Electrical Machines	EM	2	1	0	1	0	5
1232	Integrated Product Development	IP	2	2	0	0	0	5
1252	Fluid Mechanics	SM	2	2	0	0	0	5
1255	System and Measurement Technology	SUM	2	1	0	1	0	5
1262	Technical English	TE	0	4	0	0	0	5
9015	Elective Module	WM				0		5
							Total CP:	30
Fifth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						

1024	Business Administration	BW	3	1	0	0	0	5
1093	Finite Elements 1	FE1	2	2	0	0	0	5
1144	Machine Dynamics	MD	2	2	0	0	0	5
1250	Control Technology	RT	2	2	0	0	0	5
1274	Follow-up Project	VPR	1	0	0	3	0	5
9015	Elective Module	WM				0		5
							Total CP:	30

Sixth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1136	Lightweight Materials	LBW	2	2	0	0	0	5
1187	Computational Fluid Dynamics 1	CFD1	2	2	0	0	0	5
1228	Quality Management	QM	2	2	0	0	0	5
1253	Structural and Design Development	SBU	2	1	0	1	0	5
9015	Elective Module	WM				0		5
9015	Elective Module	WM				0		5
							Total CP:	30

Seventh semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1291	Bachelor Thesis	BA	0	0	0	0	0	12
1290	Colloquium	KOL	0	0	0	0	0	3
1292	Practical Project / Internship	PRA	0	0	0	0	0	15
							Total CP:	30

Abbreviations of the teaching forms: L = lecture, ST = tuition in seminars, E = exercise, S = seminar, P = practical, SSS = supervised self-study (all data in semester credit hours); CP = credit points
W/S = winter/summer semester

The practical project can optionally be replaced by a semester abroad.

Elective Modules Design and Development									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
1009	Applied Production	APR	W	2	1	0	1	0	5
1016	Automation Technology	AT	S	2	1	0	1	0	5
1022	Operational Strength	BEF	S	2	1	0	1	0	5
1082	Energy Technology	ENT	W	2	2	0	0	0	5
1088	Factory Organisation	FAO	S	2	2	0	0	0	5
3135	Gender and Diversity: Success Factors for Companies	GUD	W	2	2	0	0	0	5
1114	Innovation and Project Management	IMG	W	2	2	0	0	0	5
1123	Engineering Designing with Plastics	KMK	S	2	1	1	0	0	5
1135	Plastics Processing	KV	W	2	1	0	1	0	5
1145	Material Flow	MAT	W	2	1	0	1	0	5

1178	Molecular Materials	MOW	S	2	2	0	0	0	5
1213	Production Planning and Logistics	PPL	S	2	2	0	0	0	5
1131	Fluid Machinery	STMA	S	2	1	0	1	0	5
1268	Thermodynamics 2	TD2	W	2	2	0	0	0	5
1132	Displacement Machines	VMA	S	2	1	0	1	0	5
1278	Materials and Component Testing	WBP	W	2	0	0	2	0	5
1282	Machine Tools	WM	S	2	2	0	0	0	5
1277	Heat Transfer	WÜT	S	2	2	0	0	0	5

EDUTech									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
1303	General Didactics With Orientation Practical	EDU/AD	W	0	2	0	0	0	5
1306	Vocational Education I and Vocational Field Practical	BP1	W	0	2	0	0	0	5
1307	Vocational Education II	EDU/BP2	S	0	4	0	0	0	5
1304	Diagnosis and Support	EDU/DUF	S	0	4	0	0	0	5
1312	Didactics of Technology	EDU/TD	S	0	4	0	0	0	5

Four of the five EduTech modules can be integrated into the course of study. They then replace elective modules. The fifth module is considered an additional performance.

Appendix B: Course Schedule

for the study programme Mechanical Engineering B.Eng.

Specialisation: Energy Technology

First semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1053	Introduction to Mechanical Engineering	EMA	2	0	0	2	0	5
1091	Strength of Materials	FLE	2	2	0	0	0	5
1148	Mathematics 1	MA1	2	2	0	0	0	5
1248	Statics	STK	2	2	0	0	0	5
1265	Technical Drawing	TZ	2	1	1	0	0	5
1280	Materials Engineering	WT	2	1	0	1	0	5
						Total CP:		30
Second semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1048	Dynamics	DYN	2	2	0	0	0	5
1134	Plastics Technology	KT	2	1	0	1	0	5
1154	Mathematics 2	MA2	2	2	0	0	0	5
1087	Physics	PH	2	2	0	0	0	5
1267	Thermodynamics 1	TD1	2	2	0	0	0	5
1271	Connecting Elements	VBE	2	1	1	0	0	5
						Total CP:		30
Third semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1017	Basic Project	BP	1	3	0	0	0	5
1096	Gearbox Elements	GTE	2	1	1	0	0	5
1159	Mathematics 3	MA3	2	2	0	0	0	5
1214	Production Engineering	PRT	2	2	0	0	0	5
1227	Process and Information Management	PIM	2	2	0	0	0	5
1268	Thermodynamics 2	TD2	2	2	0	0	0	5
						Total CP:		30
Fourth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1054	Electrical Machines	EM	2	1	0	1	0	5
1252	Fluid Mechanics	SM	2	2	0	0	0	5
1255	System and Measurement Technology	SUM	2	1	0	1	0	5
1262	Technical English	TE	0	4	0	0	0	5
9016	Elective Module	WM				0		5
1277	Heat Transfer	WÜT	2	2	0	0	0	5
						Total CP:		30
Fifth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						

1024	Business Administration	BW	3	1	0	0	0	5
1082	Energy Technology	ENT	2	2	0	0	0	5
1144	Machine Dynamics	MD	2	2	0	0	0	5
1250	Control Technology	RT	2	2	0	0	0	5
1274	Follow-up Project	VPR	1	0	0	3	0	5
9016	Elective Module	WM				0		5
							Total CP:	30
Sixth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1187	Computational Fluid Dynamics 1	CFD1	2	2	0	0	0	5
1228	Quality Management	QM	2	2	0	0	0	5
1131	Fluid Machinery	STMA	2	1	0	1	0	5
1132	Displacement Machines	VMA	2	1	0	1	0	5
9016	Elective Module	WM				0		5
9016	Elective Module	WM				0		5
							Total CP:	30
Seventh semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1291	Bachelor Thesis	BA	0	0	0	0	0	12
1290	Colloquium	KOL	0	0	0	0	0	3
1292	Practical Project / Internship	PRA	0	0	0	0	0	15
							Total CP:	30

Abbreviations of the teaching forms: L = lecture, ST = tuition in seminars, E = exercise, S = seminar, P = practical, SSS = supervised self-study (all data in semester credit hours); CP = credit points
W/S = winter/summer semester

The practical project can optionally be replaced by a semester abroad.

Elective Modules Energy Technology									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
1009	Applied Production	APR	W	2	1	0	1	0	5
1016	Automation Technology	AT	S	2	1	0	1	0	5
1022	Operational Strength	BEF	S	2	1	0	1	0	5
1037	CAD	CAD	W	2	0	2	0	0	5
1088	Factory Organisation	FAO	S	2	2	0	0	0	5
1093	Finite Elements 1	FE1	W	2	2	0	0	0	5
3135	Gender and Diversity: Success Factors for Companies	GUD	W	2	2	0	0	0	5
1114	Innovation and Project Management	IMG	W	2	2	0	0	0	5
1232	Integrated Product Development	IP	S	2	2	0	0	0	5

1123	Engineering Designing with Plastics	KMK	S	2	1	1	0	0	5
1135	Plastics Processing	KV	W	2	1	0	1	0	5
1136	Lightweight Materials	LBW	S	2	2	0	0	0	5
1145	Material Flow	MAT	W	2	1	0	1	0	5
1178	Molecular Materials	MOW	S	2	2	0	0	0	5
1213	Production Planning and Logistics	PPL	S	2	2	0	0	0	5
1253	Structural and Design Development	SBU	S	2	1	0	1	0	5
1278	Materials and Component Testing	WBP	W	2	0	0	2	0	5
1282	Machine Tools	WM	S	2	2	0	0	0	5

EDUTech									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
1303	General Didactics With Orientation Practical	EDU/AD	W	0	2	0	0	0	5
1306	Vocational Education I and Vocational Field Practical	BP1	W	0	2	0	0	0	5
1307	Vocational Education II	EDU/BP2	S	0	4	0	0	0	5
1304	Diagnosis and Support	EDU/DUF	S	0	4	0	0	0	5
1312	Didactics of Technology	EDU/TD	S	0	4	0	0	0	5

Four of the five EduTech modules can be integrated into the course of study. They then replace elective modules. The fifth module is considered an additional performance.

Appendix C: Course Schedule

for the study programme Mechanical Engineering B.Eng.

Specialisation: Plastics Technology and Materials Engineering

First semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1053	Introduction to Mechanical Engineering	EMA	2	0	0	2	0	5
1091	Strength of Materials	FLE	2	2	0	0	0	5
1148	Mathematics 1	MA1	2	2	0	0	0	5
1248	Statics	STK	2	2	0	0	0	5
1265	Technical Drawing	TZ	2	1	1	0	0	5
1280	Materials Engineering	WT	2	1	0	1	0	5
							Total CP:	30
Second semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1048	Dynamics	DYN	2	2	0	0	0	5
1134	Plastics Technology	KT	2	1	0	1	0	5
1154	Mathematics 2	MA2	2	2	0	0	0	5
1087	Physics	PH	2	2	0	0	0	5
1267	Thermodynamics 1	TD1	2	2	0	0	0	5
1271	Connecting Elements	VBE	2	1	1	0	0	5
							Total CP:	30
Third semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1017	Basic Project	BP	1	3	0	0	0	5
1096	Gearbox Elements	GTE	2	1	1	0	0	5
1159	Mathematics 3	MA3	2	2	0	0	0	5
1214	Production Engineering	PRT	2	2	0	0	0	5
1227	Process and Information Management	PIM	2	2	0	0	0	5
1278	Materials and Component Testing	WBP	2	0	0	2	0	5
							Total CP:	30
Fourth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1022	Operational Strength	BEF	2	1	0	1	0	5
1054	Electrical Machines	EM	2	1	0	1	0	5
1252	Fluid Mechanics	SM	2	2	0	0	0	5
1255	System and Measurement Technology	SUM	2	1	0	1	0	5
1262	Technical English	TE	0	4	0	0	0	5
9014	Elective Module	WM				0		5
							Total CP:	30
Fifth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						

1024	Business Administration	BW	3	1	0	0	0	5
1114	Innovation and Project Management	IMG	2	2	0	0	0	5
1135	Plastics Processing	KV	2	1	0	1	0	5
1250	Control Technology	RT	2	2	0	0	0	5
1274	Follow-up Project	VPR	1	0	0	3	0	5
9014	Elective Module	WM				0		5
							Total CP:	30
Sixth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1123	Engineering Designing with Plastics	KMK	2	1	1	0	0	5
1136	Lightweight Materials	LBW	2	2	0	0	0	5
1178	Molecular Materials	MOW	2	2	0	0	0	5
1228	Quality Management	QM	2	2	0	0	0	5
9014	Elective Module	WM				0		5
9014	Elective Module	WM				0		5
							Total CP:	30
Seventh semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1291	Bachelor Thesis	BA	0	0	0	0	0	12
1290	Colloquium	KOL	0	0	0	0	0	3
1292	Practical Project / Internship	PRA	0	0	0	0	0	15
							Total CP:	30

Abbreviations of the teaching forms: L = lecture, ST = tuition in seminars, E = exercise, S = seminar, P = practical, SSS = supervised self-study (all data in semester credit hours); CP = credit points
W/S = winter/summer semester

The practical project can optionally be replaced by a semester abroad.

Elective Modules Plastics Technology and Materials Engineering									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
1009	Applied Production	APR	W	2	1	0	1	0	5
1016	Automation Technology	AT	S	2	1	0	1	0	5
1037	CAD	CAD	W	2	0	2	0	0	5
1082	Energy Technology	ENT	W	2	2	0	0	0	5
1088	Factory Organisation	FAO	S	2	2	0	0	0	5
1093	Finite Elements 1	FE1	W	2	2	0	0	0	5
3135	Gender and Diversity: Success Factors for Companies	GUD	W	2	2	0	0	0	5
1232	Integrated Product Development	IP	S	2	2	0	0	0	5
1144	Machine Dynamics	MD	W	2	2	0	0	0	5

1145	Material Flow	MAT	W	2	1	0	1	0	5
1187	Computational Fluid Dynamics 1	CFD1	S	2	2	0	0	0	5
1213	Production Planning and Logistics	PPL	S	2	2	0	0	0	5
1253	Structural and Design Development	SBU	S	2	1	0	1	0	5
1131	Fluid Machinery	STMA	S	2	1	0	1	0	5
1268	Thermodynamics 2	TD2	W	2	2	0	0	0	5
1132	Displacement Machines	VMA	S	2	1	0	1	0	5
1282	Machine Tools	WM	S	2	2	0	0	0	5
1277	Heat Transfer	WÜT	S	2	2	0	0	0	5

EDUTech									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
1303	General Didactics With Orientation Practical	EDU/AD	W	0	2	0	0	0	5
1306	Vocational Education I and Vocational Field Practical	BP1	W	0	2	0	0	0	5
1307	Vocational Education II	EDU/BP2	S	0	4	0	0	0	5
1304	Diagnosis and Support	EDU/DUF	S	0	4	0	0	0	5
1312	Didactics of Technology	EDU/TD	S	0	4	0	0	0	5

Four of the five EduTech modules can be integrated into the course of study. They then replace elective modules. The fifth module is considered an additional performance.

Appendix D: Course Schedule

for the study programme Mechanical Engineering B.Eng.

Specialisation: Production and Logistics

First semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1053	Introduction to Mechanical Engineering	EMA	2	0	0	2	0	5
1091	Strength of Materials	FLE	2	2	0	0	0	5
1148	Mathematics 1	MA1	2	2	0	0	0	5
1248	Statics	STK	2	2	0	0	0	5
1265	Technical Drawing	TZ	2	1	1	0	0	5
1280	Materials Engineering	WT	2	1	0	1	0	5
						Total CP:		30
Second semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1048	Dynamics	DYN	2	2	0	0	0	5
1134	Plastics Technology	KT	2	1	0	1	0	5
1154	Mathematics 2	MA2	2	2	0	0	0	5
1087	Physics	PH	2	2	0	0	0	5
1267	Thermodynamics 1	TD1	2	2	0	0	0	5
1271	Connecting Elements	VBE	2	1	1	0	0	5
						Total CP:		30
Third semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1017	Basic Project	BP	1	3	0	0	0	5
1096	Gearbox Elements	GTE	2	1	1	0	0	5
1145	Material Flow	MAT	2	1	0	1	0	5
1159	Mathematics 3	MA3	2	2	0	0	0	5
1214	Production Engineering	PRT	2	2	0	0	0	5
1227	Process and Information Management	PIM	2	2	0	0	0	5
						Total CP:		30
Fourth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1054	Electrical Machines	EM	2	1	0	1	0	5
1213	Production Planning and Logistics	PPL	2	2	0	0	0	5
1252	Fluid Mechanics	SM	2	2	0	0	0	5
1255	System and Measurement Technology	SUM	2	1	0	1	0	5
1262	Technical English	TE	0	4	0	0	0	5
9013	Elective Module	WM				0		5
						Total CP:		30
Fifth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						

1009	Applied Production	APR	2	1	0	1	0	5
1024	Business Administration	BW	3	1	0	0	0	5
1114	Innovation and Project Management	IMG	2	2	0	0	0	5
1250	Control Technology	RT	2	2	0	0	0	5
1274	Follow-up Project	VPR	1	0	0	3	0	5
9013	Elective Module	WM				0		5
							Total CP:	30
Sixth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1016	Automation Technology	AT	2	1	0	1	0	5
1088	Factory Organisation	FAO	2	2	0	0	0	5
1228	Quality Management	QM	2	2	0	0	0	5
9013	Elective Module	WM				0		5
9013	Elective Module	WM				0		5
1282	Machine Tools	WM	2	2	0	0	0	5
							Total CP:	30
Seventh semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1291	Bachelor Thesis	BA	0	0	0	0	0	12
1290	Colloquium	KOL	0	0	0	0	0	3
1292	Practical Project / Internship	PRA	0	0	0	0	0	15
							Total CP:	30

Abbreviations of the teaching forms: L = lecture, ST = tuition in seminars, E = exercise, S = seminar, P = practical, SSS = supervised self-study (all data in semester credit hours); CP = credit points
W/S = winter/summer semester

The practical project can optionally be replaced by a semester abroad.

Elective Modules Production and Logistics									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
1022	Operational Strength	BEF	S	2	1	0	1	0	5
1037	CAD	CAD	W	2	0	2	0	0	5
1082	Energy Technology	ENT	W	2	2	0	0	0	5
1093	Finite Elements 1	FE1	W	2	2	0	0	0	5
3135	Gender and Diversity: Success Factors for Companies	GUD	W	2	2	0	0	0	5
1232	Integrated Product Development	IP	S	2	2	0	0	0	5
1123	Engineering Designing with Plastics	KMK	S	2	1	1	0	0	5
1135	Plastics Processing	KV	W	2	1	0	1	0	5
1136	Lightweight Materials	LBW	S	2	2	0	0	0	5

1144	Machine Dynamics	MD	W	2	2	0	0	0	5
1178	Molecular Materials	MOW	S	2	2	0	0	0	5
1187	Computational Fluid Dynamics 1	CFD1	S	2	2	0	0	0	5
1253	Structural and Design Development	SBU	S	2	1	0	1	0	5
1131	Fluid Machinery	STMA	S	2	1	0	1	0	5
1268	Thermodynamics 2	TD2	W	2	2	0	0	0	5
1132	Displacement Machines	VMA	S	2	1	0	1	0	5
1278	Materials and Component Testing	WBP	W	2	0	0	2	0	5
1277	Heat Transfer	WÜT	S	2	2	0	0	0	5

EDUTech									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
1303	General Didactics With Orientation Practical	EDU/AD	W	0	2	0	0	0	5
1306	Vocational Education I and Vocational Field Practical	BP1	W	0	2	0	0	0	5
1307	Vocational Education II	EDU/BP2	S	0	4	0	0	0	5
1304	Diagnosis and Support	EDU/DUF	S	0	4	0	0	0	5
1312	Didactics of Technology	EDU/TD	S	0	4	0	0	0	5

Four of the five EduTech modules can be integrated into the course of study. They then replace elective modules. The fifth module is considered an additional performance.

Appendix E: Course Schedule

for the study programme Mechanical Engineering B.Eng.

Cooperative Engineering Training

First semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1053	Introduction to Mechanical Engineering	EMA	2	0	0	2	0	5
1091	Strength of Materials	FLE	2	2	0	0	0	5
1148	Mathematics 1	MA1	2	2	0	0	0	5
1248	Statics	STK	2	2	0	0	0	5
1265	Technical Drawing	TZ	2	1	1	0	0	5
1280	Materials Engineering	WT	2	1	0	1	0	5
							Total CP:	30
Second semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1048	Dynamics	DYN	2	2	0	0	0	5
1134	Plastics Technology	KT	2	1	0	1	0	5
1154	Mathematics 2	MA2	2	2	0	0	0	5
1087	Physics	PH	2	2	0	0	0	5
1267	Thermodynamics 1	TD1	2	2	0	0	0	5
1271	Connecting Elements	VBE	2	1	1	0	0	5
							Total CP:	30
Third semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1017	Basic Project	BP	1	3	0	0	0	5
1096	Gearbox Elements	GTE	2	1	1	0	0	5
1159	Mathematics 3	MA3	2	2	0	0	0	5
1214	Production Engineering	PRT	2	2	0	0	0	5
1227	Process and Information Management	PIM	2	2	0	0	0	5
	Specialisation Module							5
							Total CP:	30
Fourth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1054	Electrical Machines	EM	2	1	0	1	0	5
1252	Fluid Mechanics	SM	2	2	0	0	0	5
1255	System and Measurement Technology	SUM	2	1	0	1	0	5
1262	Technical English	TE	0	4	0	0	0	5
	Specialisation Module							5
9013	Elective Module	WM				0		5
							Total CP:	30

Practical year and skilled worker or journeyman examination

Fifth and sixth semesters			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1291	Practical Project / Internship	PRA	0	0	0	0	0	15
Seventh semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1024	Business Administration	BW	3	1	0	0	0	5
1250	Control Technology	RT	2	2	0	0	0	5
	Specialisation Module							5
	Specialisation Module							5
1274	Follow-up Project	VPR	1	0	0	3	0	5
9013	Elective Module	WM				0		5
							Total CP:	30
Eighth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1228	Quality Management	QM	2	2	0	0	0	5
	Specialisation Module							5
	Specialisation Module							5
	Specialisation Module							5
9013	Elective Module	WM				0		5
9013	Elective Module	WM				0		5
							Total CP:	30
Ninth semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
1291	Bachelor Thesis	BA	0	0	0	0	0	12
1290	Colloquium	KOL	0	0	0	0	0	3
							Total CP:	15

Abbreviations of the teaching forms: L = lecture, ST = tuition in seminars, E = exercise, S = seminar, P = practical, SSS = supervised self-study (all data in semester credit hours); CP = credit points
W/S = winter/summer semester

Appendix F: Module catalogue

for the study programme Mechanical Engineering B.Eng.

General Didactics With Orientation Practical					EDU/AD
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1303	150 h	5	3rd semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Seminar lessons	30 students	2	SCH	30	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	80	h	10	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students

- understand didactics as a sub-discipline of education and are able to draw further boundaries to neighbouring disciplines and related disciplines as well as to identify subject areas and functions of didactics.
- are able to distinguish between selected didactic theories and models and to highlight the significance of these theoretical foundations for the planning of teaching-learning processes.
- have a basic knowledge and understanding of categories of teaching, can apply them in initial planning attempts and critically evaluate them.
- are able to transfer the steps of lesson planning and use them for their own teaching encounter in the orientation practical.
- are able to critically question this knowledge, to modify the resulting questions in exploratory questions and to systematically elaborate them during the orientation practical.
- reflect on their own developmental process and include both their first practical professional experiences and theoretical discussions of different subjects of exploration.

3 Contents:

- Genesis, subject areas/fields of activity, basic concepts and research approaches of general didactics
- Didactic theories, e.g. didactics of educational theory, learning-/teaching theory didactics, constructivist didactics, didactics of educational pathways
- Structure and planning logic of teaching
- Basic forms of didactic lesson planning, implementation and analysis

4	Forms of teaching: Seminar lessons	
5	Participation requirements:	
	Formal:	
	Content:	
6	Forms of assessment: Oral examination	
7	Prerequisite for the award of credit points: Module examination pass and course assessment	
8	Application of the module (in the following study programmes) Electrical Engineering B.Eng. and Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade: according to BRPO	
10	Module coordinator: Prof. Dr.-Ing. Thorsten Jungmann	
11	Other information:	
12	Language: German	

Applied Production					APR
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1009	150 h	5	5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The participants learn how to use production possibilities in a practical way. They are enabled to analyse and apply technically and economically optimal production possibilities and then transfer the results into industrial practice.	
3	Contents:	
	Importance of production technology with regard to optimal production chains, resulting component properties and alternative production possibilities with conventional and modern materials. For practical application, the optimal production process is to be determined with the respective process-specific advantages and disadvantages. for general and specific component production for both prototypes and mass production	
4	Forms of teaching:	
	Lecture, seminar-based teaching, practical course	
5	Participation requirements:	
	Formal:	None
	Content:	None
6	Forms of assessment:	
	Written examination or oral examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Dragan Vucetic	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Automation Technology					AT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1016	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students are able to analyse automation tasks from industrial practice and systematically develop solutions. Knowledge of modern computer-aided measurement and automation systems is acquired and deepened in the practical course (PLC programming). This qualifies the students to design and evaluate automation systems.

3 Contents:

Introduction (basic terms, standards, examples, aim of the lecture)

- General requirements for automation devices (real-time capability, safety, robustness)
- Process concept and process description
- Actuators and sensors, special features of process measurement technology
- Formal description of the functionality of controllers (input languages according to IEC 1131-3, programmable logic controllers (PLCs), introduction to Petri nets)
- Basics of industrial communication, especially bus systems

4 Forms of teaching:

Lecture with integrated application examples and practical course

5 Participation requirements:

Formal:	None
Content:	Control engineering' (1250)

6 Forms of assessment:

Written or oral examination; in each case with preliminary examination performance

7 Prerequisite for the award of credit points:

Module examination pass with preliminary examination

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Sebastian Hoffmann

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

German

Bachelor Thesis					BA
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1291	360 h	12	6th or 7th semester	each semester	12 weeks

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	360	h
	Seminar lessons	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	With the bachelor thesis, each candidate demonstrates that he/she is able to complete a practice-oriented task from his/her subject area within a specified period of time, both in its subject-specific details and in the interdisciplinary contexts, working independently and according to scientific methods.	
3	Contents:	
	The bachelor thesis is usually an independent investigation with an engineering science or engineering technology task. It should deal with the subject matter in detailed descriptions and explanations It should deal with the subject matter in detailed descriptions and explanations and be prepared as a written paper.	
4	Forms of teaching:	
5	Participation requirements:	
	Formal:	None
	Content:	Coordinated topic from the student's special subject area
6	Forms of assessment:	
7	Prerequisite for the award of credit points:	
8	Application of the module (in the following study programmes)	
	Apparative Biotechnology B.Sc., Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng., Mechanical Engineering B.Eng., Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Anton Klar	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Basic Project					BP
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1017	150 h	5	3rd semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	1	SCH	15	h	22.5	h
	Seminar lessons	30 students	3	SCH	45	h	67.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students know the first methods of project management, design systems, quality planning, programming, self-management, project documentation and presentation techniques. Students are able to apply these methods in a targeted manner to solve a technical task in a team. They can critically question and analyse their own working methods and approaches and evaluate them in comparison to other teams. The students have the social and professional competence to organise themselves as a team.

3 Contents:

- Project management, - construction, - quality planning, - programming, self-management, - project documentation and presentation techniques,

Working on a technical task in a team,
- Concept, design, construction and commissioning of a technical plant,
- Presentation of the concept and the technical solution,
- Preparation of protocols and technical documentation,
- Project structuring,
- Cooperation and division of tasks in the team,
- Social skills,
- Problem solving methods,
- Creativity techniques,
- Specifications,
- Specifications,

4 Forms of teaching:

Lectures, seminar teaching

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Course assessment, performance exam or project work

7 Prerequisite for the award of credit points:

Module examination pass and course assessment

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

	Prof. Dr.-Ing. Bruno Hüsgen
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Vocational Education I and Vocational Field Practical					BP1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1306	150 h	5	3rd or 5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Seminar lessons	30 students	2	SCH	30	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	80	h	10	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students:

- understand vocational education as a sub-discipline of educational science, are able to distinguish the respective subject areas and research fields from each other and explain them in context.
- systematically reflect on exemplary practical experiences in the workplace and thereby also examine motives for their own career paths.
- are able to identify requirements for company and school educators and in this context understand vocational education as a profession.
- can describe the structures, forms and interfaces of the vocational education and training system in Germany in a differentiated manner and consider the historical, educational policy and legal framework conditions.
- use tools of scientific work competently.

3 Contents:

- Concepts, subject areas and research fields of educational science and vocational education as a sub-discipline of educational science,
- Objectives, structures and interfaces of the Vocational Educational Training (VET) system, legal framework of VET,
- Contributors and roles in the VET system,
- Processes of (vocational) pedagogical professionalisation
- Software tools: Word processing programme, literature management programme
- Methods of scientific work: Research, source work, text production

4 Forms of teaching:

Seminar lessons

5 Participation requirements:

Formal:	
Content:	

6 Forms of assessment:

Oral examination

7 Prerequisite for the award of credit points:

Module examination pass and course assessment

8 Application of the module (in the following study programmes)

Electrical Engineering B.Eng. and Mechanical Engineering B.Eng.

9 Importance of the grade for the final grade:

	according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Thorsten Jungmann
11	Other information:
12	Language: German

Vocational Education II					EDU/BP2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1307	150 h	5	6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Seminar lessons	30 students	4	SCH	60	h	90	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students:

- are able to derive vocational education issues or problems and to deal with them in a systematic and theoretically sound manner, taking into account existing criteria of scientific work,
- can plan and prepare vocational training, apply training methods and design the completion of training,
- are able to describe the process of developing a teaching-learning scenario,
- interpret and didactically transform a selected learning field based on the framework curriculum of a training occupation.
- recognise interfaces to general and subject-related didactics in the context of Vocational Educational Training (VET) research and empirical classroom research.
- can critically reflect and classify current research trends in VET research on the basis of their level of knowledge. In this context, they discover possible research desiderata in their own profession-specific field,

3 Contents:

- Scientific work: Plan, structure, write and prepare texts for publication,
- Research objects, research questions and research methods in education and training or vocational education and training research,
- Concept of practice or action research to explore own teaching,
- Learning field and competence-oriented design of lessons,
- Action-oriented methods for training, instruction and teaching,
- Training regulations, training plan and examination

4 Forms of teaching:

Seminar lessons

5 Participation requirements:

Formal:	
Content:	

6 Forms of assessment:

Term paper

7 Prerequisite for the award of credit points:

	Module examination pass
8	Application of the module (in the following study programmes) Electrical Engineering B.Eng. and Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Thorsten Jungmann
11	Other information:
12	Language: German

Operational Strength					BEF
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1022	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students:

- learn about the influence of cyclic loads on the material behaviour and can assess the influence of cracks on the component behaviour
- can evaluate the influence of different design boundary conditions on the fatigue strength
- can establish correlations to partial building damage on the basis of this behaviour
- understand the selected test methods for cyclic loading and can derive relevant characteristic values for component design
- develop skills to calculate the service life of cyclically loaded components under multi-stage, real operating stresses using simple examples
- become familiar with aspects of fracture mechanics and, based on this, are able to take into account the influence of cracks in the design of components under cyclic stresses

3 Contents:

- Fundamentals of fatigue behaviour, especially of metallic materials
- Wöhler Curve and statistical influences
- Notch effect and influence on fatigue strength
- Other selected parameters influencing fatigue strength
- Concepts (Miner rule) for lifetime prediction for single and multi-hour cyclic loads
- Special material tests under cyclic loading (fatigue tests, compression mechanics)
- Counting method and lifetime prediction for real stress-time functions
- Fundamentals of static fracture mechanics
- Application of fracture mechanics in lifetime prediction under cyclic loads

4 Forms of teaching:

Lecture, seminar-based teaching, practical course

5 Participation requirements:

Formal:	None
Content:	Materials Engineering Module (1280)

6	Forms of assessment: Written examination or oral examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Thomas Kordisch
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Business Administration					BW
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1024	150 h	5	3rd or 5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	3	SCH	45	h	67.5	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: The students know the basic organisational and legal structures of companies and are familiar with the optimisation tasks in selected entrepreneurial functional areas as well as with the basic principles and success criteria of economic action in order to be able to classify their engineering activities in a business management context and to evaluate the economic consequences of their activities. The students master methods and tools for problem solving in selected corporate functional areas. They can apply business management instruments and calculation methods in a target-oriented manner and assess their effects.
3	Contents: • Basic concepts of business administration / basic principles of economic action • Overview of the entrepreneurial functional areas of the goods economy, financial economy and information economy level • Corporate goals and corporate key figures / key figure systems • Basic concepts of private and commercial law • Forms of corporate law
4	Forms of teaching: Lecture, seminar-based teaching with case studies / case studies / exercises
5	Participation requirements: Formal: Content:
6	Forms of assessment: Written examination, combination examination, performance examination or oral examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng., Mechanical Engineering B.Eng. and Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. rer. pol. Hildegard Manz-Schumacher
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

CAD					CAD
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1037	150 h	5	3rd or 5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	0	SCH	0	h	0	h
	Exercise	20 students	2	SCH	30	h	45	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: By successfully completing the CAD module, the student is able to apply the methods and systems for modelling three-dimensional individual parts and assemblies. On this basis, each participant will be able to assess the performance of a commercially available, associative and modular 3D CAD system and to use it in practice, as well as know the basics of product lifecycle management.
3	Contents: - Solid modelling - Coordinate systems, sketches, skeleton and auxiliary geometry - Free, relative or associative positioning - CSG models and BREP models - Generation techniques for basic bodies - Hybrid volume models and associated history tree - Parameterised features - Introduction to assembly modelling - 3D CAD modelling methodology with regard to individual parts, assemblies and free-form surfaces - 3D animation of simple kinematics - Introduction to the product life cycle and related data management - Product Lifecycle Management in companies
4	Forms of teaching: Lecture and exercises. Projection of more complex processes
5	Participation requirements: Formal: None Content: Technical Drawing (1265), Fasteners (1271)
6	Forms of assessment: Oral examination or examination accompanying the course
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng. and Industrial Engineering and Management B.Sc.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Raimund Kisse
11	Other information: Literature will be announced at the beginning of the course.

12	Language: German

Diagnosis and Support					EDU/DUF
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1304	150 h	5	4th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Seminar lessons	30 students	4	SCH	60	h	90	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students...

- can explain selected learning theories and distinguish them from each other. In addition, they are able to point out application references from the different theories in a well-founded manner.
- have diagnostic competence and apply it in the context of pedagogical action, taking empirical findings into account.
- are able to demonstrate the significance of competence orientation for the vocational education system and to assess its consequences, especially for the design of competence-oriented examinations.
- know teaching features relevant to learning and can reflect on their significance against the background of their own learning biographical experiences. They are able to design effective learning environments, plan and conduct appropriate forms of assessment.
- have a critical understanding of the aspects of diversity and heterogeneity in learning groups and, in this context, have basic knowledge of the individual support of learners and their learning processes.

3 Contents:

- Cognitive development and personality development,
- Learning theories and motivation,
- Teaching and performance measurement,
- Competence orientation, competence-oriented examinations,
- Individuality and heterogeneity in learning groups, individual support,
- Professional teaching perception,
- Research methodological basics on observation, observation and assessment tools, observation and assessment errors.

4 Forms of teaching:

Seminar lessons

5 Participation requirements:

Formal:	
Content:	

6 Forms of assessment:

Oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Electrical Engineering B.Eng. and Mechanical Engineering B.Eng.

9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Thorsten Jungmann
11	Other information:
12	Language: German

Dynamics					DYN
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1048	150 h	5	2nd semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The students recognise and learn the interrelationships between movement processes, model building and the mathematical description for machine development and design.	
3	Contents:	
	1) Kinematics of mass points, systems and rigid bodies 2) Kinetics of mass points, systems and rigid bodies 3) Energy, work, power, efficiency 4) Vibration processes of simple mechanical systems	
4	Forms of teaching:	
	Lecture, seminar in small groups	
5	Participation requirements:	
	Formal:	None
	Content:	None
6	Forms of assessment:	
	Written examination or oral examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Paul Diekmann	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Introduction to Mechanical Engineering					EMA
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1053	150 h	5	1st semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	2	SCH	30	h	45	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: The students know the different fields of activity of mechanical engineers. They understand the requirements for successful engineers derived from the activities. They can apply this knowledge to decide whether studying mechanical engineering makes sense for them, taking into account their own strengths, weaknesses and interests. In addition, they can develop initial ideas about which of the possible areas of specialisation they are particularly interested in, which strengths they bring to the table and which weaknesses they should work on intensively. In addition, they also learn to assess which activities or sectors will gain in importance in the future. By working in groups, the students gain experience in working together and presenting tasks.
3	Contents: - Presentation of various professional activities of mechanical engineers in different industries, companies or authorities (internal and external speakers), - Demands made on successful engineers from industry/professional life. - Planning studies and preparing for a successful transition from school to higher education and later to employment. - Getting to know the university's laboratories, sensible practical course preparation, participation and documentation. - Insights into the research activities of the professors/mechanical engineering. - Future requirements for engineers
4	Forms of teaching: Lecture, practical course
5	Participation requirements: Formal: None Content: None
6	Forms of assessment: Course assessment
7	Prerequisite for the award of credit points: Module examination pass and course assessment
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO

10	Module coordinator: Prof. Dr.-Ing. Bruno Hüsgen
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Electrical Machines					EM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1054	150 h	5	4th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students can analyse and calculate simple linear circuits with the help of complex alternating current calculation. The different types of power (active, reactive and apparent power) are understood. Students understand the basic physical principles of electrical machines and drives and can evaluate, select and apply the different types of machines in an industrial environment. Analysis of equivalent circuit diagrams and operating characteristics is also part of this course.

3 Contents:

1. Electrical engineering basics:
Power, work, efficiency in mechanics and electrical engineering. Linear oneports R, L and C. Characteristics of periodic stresses. Complex alternating current calculation. Active, reactive and apparent power. Moment formation in electrical machines. Three-phase alternating current.
2. Special electrical machines:
Direct current machine, three-phase asynchronous machine, synchronous machine
3. Introduction to modern drive technology and current straightening technology. Integrated practical experiment: Operating behaviour, characteristic curve recording

4 Forms of teaching:

Lecture, seminar, laboratory practical course

5 Participation requirements:

Formal:	None
Content:	Mathematics (complex numbers). Physics (electricity)

6 Forms of assessment:

Written examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Sebastian Hoffmann

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

German

Energy Technology					ENT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1082	150 h	5	5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students are able to design, develop and assess thermal and regenerative energy processes and to operate plants by:

1. acquiring knowledge of the physical/technical, ecological and economic fundamentals of energy systems and
2. developing the ability to transfer this knowledge to energy engineering tasks and thus
3. acquiring the competence to present systemic solutions taking into account the diverse, often contradictory technical/physical, economic and ecological requirements.
4. They can explain and defend the applications of energy technology argumentatively.

3 Contents:

- Energy conversion
- Combustion and combustion calculation
- Energy, climate and legal requirements
- Power plant concepts
- Combined heat, power and cooling
- Nuclear power
- Regenerative energy production

4 Forms of teaching:

Lecture and seminar teaching

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr. Peter Charles

11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Factory Organisation					FAO
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1088	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The students recognise the basics of factory organisation and have practised typical tasks using practical examples. They are able to recognise correlations and apply them in their field of work. The students have a general overview of the typical tasks in factory organisation.	
3	Contents:	
	After teaching the basics of factory organisation and production, the relevant aspects are covered: - Introduction Production - Production planning and control - Work preparation - Supply chain management - Factory planning - Digital factory - Strategic Management / Organisation - LEAN Management / Industrial Engineering - Basics Change Management	
4	Forms of teaching:	
	Lecture, seminar	
5	Participation requirements:	
	Formal:	None
	Content:	None
6	Forms of assessment:	
	Written examination or oral examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Jürgen Sauser	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Strength of Materials					FLE
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1091	150 h	5	1st semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	Students learn the fundamentals of elastic material behaviour and the basic load types. They will acquire skills to analyse, calculate and evaluate the stress on components.	
3	Contents:	
	1) Tensile and compressive stress 2) Surface pressure 3) Bend 4) Shear stress 5) Torsion 6) Buckling 7) Composite stress, strength hypotheses	
4	Forms of teaching:	
	Lecture, seminar	
5	Participation requirements:	
	Formal:	None
	Content:	None
6	Forms of assessment:	
	Written examination or oral examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Raimund Kisse	
11	Other information:	
	Literature will be announced at the beginning of the course. Kisse, R., Technische Mechanik - Festigkeitslehre, Lecture Notes	
12	Language:	
	German	

Finite Elements 1					FE1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1093	150 h	5	5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	Students learn the theoretical and numerical basics of the finite element method, modelling techniques and its application to the analysis of elastostatic systems	
3	Contents:	
	Theoretical foundations: Element stiffness relation, shape function, transformation and structure of the stiffness matrix, energy approach, multi-dimensional element properties, connecting elements, coordinate systems, bearing, loading and coupled boundary conditions. Modelling techniques, evaluation and transfer of the results to the design of components	
4	Forms of teaching:	
	Lecture, seminar in small groups	
5	Participation requirements:	
	Formal:	None
	Content:	Strength of Materials (1091), Mathematics 3 (1159)
6	Forms of assessment:	
	Written or oral examination; in each case with preliminary examination performance	
7	Prerequisite for the award of credit points:	
	Module examination pass with preliminary examination	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Paul Diekmann	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Gender and Diversity: Success Factors for Companies					GUD
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
3135	150 h	5	5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students ..

- know the terms, history and differences of gender/gender mainstreaming and diversity/diversity management.
- know legal principles in the context of gender and diversity (e.g. EU Anti-Discrimination Directive, General Equal Treatment Act)
- are sensitised to human heterogeneity in the corporate context.
- independently recognise stereotyping and can develop ideas for possible changes in the business environment.
- are able to independently collect relevant information on established concepts such as gender mainstreaming and diversity management and to assess their relevance for professional practice.
- are familiar with selected theories and approaches in the current discourse on diversity management and, building on this, are able to develop conceptual ideas for the implementation of holistic diversity management in a corporate context.

3 Contents:

- Definitions and delimitation of gender and diversity
- Concepts and approaches to equal opportunities (e.g. diversity management, gender mainstreaming)
- Legal basis and political influences (e.g. EU Anti-Discrimination Directive, General Anti-Discrimination Directive, General Equal Treatment Act (German abbreviation: AGG))
- Subjective and social values, attitudes and prejudices in the context of diversity
- Possible approaches for taking diversity characteristics (e.g. gender and age) into account in selected areas of business (marketing, product development, human resources)
- Concept for the sustainable introduction of holistic diversity management
- Case studies and application examples from business practice

4 Forms of teaching:

Lecture, seminar-based teaching, presentation, group work, presentation of seminar paper

5 Participation requirements:

Formal:	
Content:	None

6	Forms of assessment: Term paper, written examination, project work or oral examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Applied Mathematics B.Sc., Apparative Biotechnology B.Sc., Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng., Mechanical Engineering B.Eng., Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Andrea Kaimann
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Gearbox Elements					GTE
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1096	150 h	5	3rd semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	1	SCH	15	h	22.5	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students can classify the different gearbox elements. They are able to depict these themselves in technical drawings and know their function and structure. In addition, they master basic design rules for the use of gearbox elements and are able to determine essential calculation factors themselves with the help of diagrams and formulae. They can assess the relevance of calculation factors for the respective load case.
They know the basic stress types and frequently occurring failure types of gearbox elements, as well as the effects on the dimensioning and design. Furthermore, the students are able to make initial reasonable assumptions for the design of gears/elements with the help of design calculations.
Students can identify critical cross-sections for gears and shafts/axles and carry out corresponding strength checks. They are able to create their own designs of shafts and axles for the respective application.
They are able to distinguish between different types of gearboxes and can evaluate gearbox designs with regard to their quality. The students are able to select the appropriate plain and rolling bearings for the respective application and to carry out the corresponding service life verifications.
They can name the different types of gearing and explain how gearing works. They know how to create the basic tooth shape geometrically. They are able to calculate the geometric parameters for spur gears themselves.

3 Contents:

- Axles and shafts: Function, design and strength calculation
- Rolling bearings: Function, arrangement, design
- Plain bearing: Types, function, design
- Types of gearing, geometric basics
- Geometry and strength of the spur gear teeth

4 Forms of teaching:

Lecture, seminar, exercise

5 Participation requirements:

Formal:	None
Content:	Statics (1248), Strength of Materials (1091), Technical Drawing

		(1265), Connecting Elements (1271) Materials engineering (1280) Modules: 1091 Strength of Materials; 1248 Statics; 1265 Technical Drawing; 1271 Connecting Elements; 1280 Materials Engineering;
6	Forms of assessment: Written examination, oral examination or examination accompanying the course; each with preliminary examination	
7	Prerequisite for the award of credit points: Module examination pass with preliminary examination	
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade: according to BRPO	
10	Module coordinator: Prof. Dr.-Ing. Jan Robert Ziebart	
11	Other information: Literature will be announced at the beginning of the course.	
12	Language: German	

Innovation and Project Management					IMG
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1114	150 h	5	5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students:

- are prepared to lead product development and innovation projects and teams to success in terms of holistic and strategically oriented project management (also including agile methods).
- can explain the most important instruments of project management and use the elementary technical vocabulary.
- are able to lead/manage a project in a given process-organisational project organisation.
- are able to develop and specifically use control options for different project phases (controlling of the degree of completion, cost controlling).
- can explain the specifics of team building and project management.
- can carry out the moderation of team meetings projects.
- know instruments of IT-supported project management.
- can explain the importance of corporate objectives and are able to distinguish between different management cultures.
- can name essential aspects of industrial property protection.

3 Contents:

- Basics of innovation and project management (terms/ methods/ instruments)
- Innovation techniques in product development
- Methods of idea generation (creativity techniques)
- Basics for setting up creativity workshops
- Project phase models and planning systems (project preparation, project planning, project implementation, project completion)
- Project organisation forms
- Innovation and change management, self-management
- Project planning (project structure plan/ cost plan/ resource plan/ schedule)
- Project documentation/ project controlling
- Risk management
- Special features of the use of methods in innovation projects
- (Strategic preparation / initiation, planning, monitoring and control of innovation projects)

	• Leading project and innovation teams (social structures, special communication situations in projects, real and virtual project work, problem analysis and concepts for action) • Stakeholder management (factors influencing the successful management of projects) • Trainings and workshops on selected technical examples • Basic aspects of industrial property protection
4	Forms of teaching: Lecture, seminar
5	Participation requirements:
	Formal: None
	Content: None
6	Forms of assessment: Written examination or oral examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Michael Fahrig
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Integrated Product Development					IP
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1232	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: The students distinguish between different product development processes and know different development methods and tools. They can select and apply these methods in a targeted manner. They are able to work methodically, systematically and purposefully on a technical problem area and apply guiding rules for methodical development.
3	Contents: Methodical development of products (based on VDI 2206, 2221, 2222, among others) Planning, tasks, specifications/requirements list, development structuring -> Overall function, sub-functions, functional structure, Idea generation/creativity process -> Overview of methods, discursive and intuitive methods, evaluation of alternative solutions, evaluation procedures. Selected development guidelines (e.g. cost-conscious development, design in accordance with stresses)
4	Forms of teaching: Lecture, seminar-based teaching, practical exercises
5	Participation requirements: Formal: None Content: None
6	Forms of assessment: Written examination, combination examination, performance examination or oral examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Apparative Biotechnology B.Sc., Engineering Computer Sciences B.Eng., Mechanical Engineering B.Eng. and Mechatronics B.Sc.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Klaus Dürkopp
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Colloquium					KOL
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1290	90 h	3	6th or 7th semester	each semester	

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	90	h
	Seminar lessons	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The colloquium is to be assessed as an independent examination. It serves to determine whether the candidate is capable of orally presenting and independently justifying the scientific topic of the bachelor thesis, its subject-related foundations, its interdisciplinary connections and its non-subject-related references, as well as its significance for practical applications.	
3	Contents:	
	- Content of the thesis according to the topic - Disputation on the procedure in the preparation of the thesis and the questions that arose in the context of the thesis	
4	Forms of teaching:	
	Oral examination for the bachelor thesis	
5	Participation requirements:	
	Formal:	None
	Content:	Treatment of the bachelor thesis
6	Forms of assessment:	
	Oral examination	
7	Prerequisite for the award of credit points:	
8	Application of the module (in the following study programmes)	
	Applied Mathematics B.Sc., Apparative Biotechnology B.Sc., Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng., Mechanical Engineering B.Eng., Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Anton Klar	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Engineering Designing With Plastics					KMK
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1123	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	1	SCH	15	h	22.5	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: The students are able to design components made of plastic in a way that is suitable for the material and the tool. They can assess the properties of plastics in processing and use and thus select suitable materials for a specific application. They know the necessary tooling techniques and can design a simple tool to manufacture an injection-moulded part.
3	Contents: - Plastics as construction materials, special properties - Manufacturing (processes, especially injection moulding) - Process simulation, application - Material mechanics, material selection with databases - Moulds (construction and standards, tempering, demoulding) - General design rules
4	Forms of teaching: Lecture, exercise, practical course
5	Participation requirements: Formal: None Content: None
6	Forms of assessment: Written exam or combination exam
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng. and Mechatronics B.Sc.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Christoph Jaroschek
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Plastics Technology					KT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1134	150 h	5	2nd or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students know the history and the economic importance of plastics. They understand the connection between technical progress and economic use. They know how plastics are produced and technically processed. They can assess for which technical application a plastic is suitable and can select or critically evaluate suitable manufacturing processes for component production. The students can apply the theoretically acquired knowledge in practice for the interpretation of practical/experimental results.

3 Contents:

- History of plastics, economic significance
- General differences to metals
- Model conception and morphology (structural design)
- Crystallisation conditions
- Synthesis of plastics
- Mechanical behaviour (modulus of elasticity, creep modulus)
- Rheology (flow properties, viscosity and viscosity models)
- Processing method
- Influence of processing on the material/component properties,
- Joining of plastics (bonding and welding)
- Recycling of plastics

4 Forms of teaching:

Lectures, seminar, practical course

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination, combination examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng. and Mechatronics B.Sc.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Bruno Hüsgen

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

	German

Plastics Processing					KV
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1135	150 h	5	5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The students can select a suitable manufacturing process for the production of plastic components by knowing the special physical principles of plastics in processing and use and can thus determine the requirements for the machine technology for primary moulding, especially injection moulding. They can assess the influences of the manufacturing process on the quality of components and design strategies to ensure lasting quality in mass production.	
3	Contents:	
	Physical properties of plastics for processing Heat transport processes in plastics processing (steady-state and transient) Flow processes of plastic melts (rheology) – Simulation Application Injection moulding – Process and influences on quality, special processes Machine technology – Melt production with screws Quality optimisation; Statist. design of experiments	
4	Forms of teaching:	
	Lecture, seminar-based teaching and practical course	
5	Participation requirements:	
	Formal:	None
	Content:	Module Plastics Technology (1134)
6	Forms of assessment:	
	Written examination, combination examination or oral examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Christoph Jaroschek	
11	Other information:	
	Literature will be announced at the beginning of the course. Jaroschek, Spritzgießen für Praktiker, Carl Hanser Verlag	
12	Language:	
	German	

Lightweight Materials					LBW
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1136	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students:

- learn about the special aspects and characteristics of lightweight construction and can apply them in the evaluation and selection of materials,
- understand the specific material behaviour of different lightweight materials and can compare and analyse them,
- can explain the specific properties of the material groups with the microstructure and the alloy concept,
- develop skills to evaluate the application potential of different material groups with regard to lightweight construction potential and to apply them in component design
- understand the special aspects in the behaviour of materials at high temperatures and can evaluate the relevance of this behaviour with regard to the application.

3 Contents:

- Fundamentals of relevant material parameters with regard to the aspect of lightweight construction in relation to the material requirements
- Lightweight potential and special material properties as well as alloy-technical and microstructural peculiarities of the following material groups:
  - High-strength steels
  - Aluminium alloys
  - Magnesium alloys
  - Titanium alloys
  - Fibre composites
- Application examples of lightweight materials

4 Forms of teaching:

Lecture, seminar-based teaching

5 Participation requirements:

Formal:	None
Content:	Materials Engineering Module (1280)

6 Forms of assessment:

Written examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

	Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Thomas Kordisch
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Machine Dynamics					MD
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1144	150 h	5	5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Instrumental competence:
Basic theoretical and practical knowledge of the dynamics of machines and drive systems.
Systematic competence:
Dynamic problems occurring in drive systems and machines should be reliably recognised, described, evaluated and solved and scientifically sound judgements derived from them to learn independently what role machine dynamics plays in machine technology. This is to be proven in further machine applications of their own.
Identify interface problems and deal with them in interdisciplinary cooperation.
Communicative competence:
To present and disseminate the dynamic stresses of mechanical engineering apparatus in a communicative manner.

3 Contents:

Imparting basic theoretical and practical knowledge on the dynamics of machines and drive systems.
Classification and tasks of machine dynamics, determination of characteristic values of dynamic parameters – analytically / experimentally, vibration engineering
Basic terms, flywheel calculation, balancing and running behaviour of rotors, free undamped / damped vibrations with one degree of freedom, method for determining the natural angular frequency of technical vibration systems (method of influence numbers), forced vibrations with one degree of freedom, torsional vibrations - single-/multi-mass systems,
Linear vibrations with several degrees of freedom, vibrations of continuous systems, simulation software Balancing technology in theory – rigid and elastic rotor
Laval rotor, balancing machines – displacement and force measuring balancing machines
Measurement technology and evaluation of vibrations: FFT, DFT
Condition monitoring: especially rolling bearings

4 Forms of teaching:

Lecture and seminar teaching

5	Participation requirements:	
	Formal:	None
	Content:	Modules: 1048 Dynamics; 1087 Physics; 1152 Mathematics 2; 1159 Mathematics 3; 1248 Statics
6	Forms of assessment: Written examination or oral examination	
7	Prerequisite for the award of credit points: Module examination pass	
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade: according to BRPO	
10	Module coordinator: Prof. Dr.-Ing. Jürgen Hermeler	
11	Other information: Literature will be announced at the beginning of the course.	
12	Language: German	

Material Flow					MAT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1145	150 h	5	3rd or 5th semester	Annual (Winter)	1 semester

	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
1	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	Students learn the basic elements and the interaction in context, selection and use of standards and guidelines. Systems thinking with reference to detail is deepened and can be applied and assessed in a practical way. Concrete examples consolidate the knowledge and create transferability into other modules and into practice.	
3	Contents:	
	Technology of material flow systems. Interlinked and automated systems. Concepts and principles of supply and disposal of production. Key figures such as system performance and availability. Importance of interfaces and resources – from planning to operation.	
4	Forms of teaching:	
	See line 1 with addition/integration of workshops, project work, site visits, trade fairs, guest lectures	
5	Participation requirements:	
	Formal:	None
	Content:	None
6	Forms of assessment:	
	Written examination, project work or oral examination; in each case with examination preparation	
7	Prerequisite for the award of credit points:	
	Module examination pass with preliminary examination	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Jürgen Sauser	
11	Other information:	
	Literature will be announced at the beginning of the course. Information and documents are available on one platform.	
12	Language:	
	German	

Mathematics 1					MA1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1148	150 h	5	1st semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The students know the basic concepts of differential calculus and linear algebra. The students are able to analyse and solve simple technical problems from the field of mechanical engineering with the help of the methods of differential calculus and linear algebra, as well as by using suitable software.	
3	Contents:	
	Differential calculus: Functions, relations, sequences, series, limits, limit theorems, continuity, derivation, derivation rules, power series, extrema, curve discussion. Linear algebra: Vectors, vector space, scalar product, vector product, matrices, determinants, equations, systems of linear equations. Computer algebra: Introduction to a computer algebra system for solving mathematical problems, such as Maple or Mathematica.	
4	Forms of teaching:	
	Lecture, seminar	
5	Participation requirements:	
	Formal:	None
	Content:	Good basic mathematical knowledge at German 'Fachoberschulniveau' level
6	Forms of assessment:	
	Written examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr. rer. nat. Martin Petry	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Mathematics 2					MA2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1154	150 h	5	2nd semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: The students know the basic concepts of integral calculus and the theory of differential equations. Students are able to analyse and solve simple technical problems from the field of mechanical engineering using the methods of integral calculus and the theory of differential equations, also through the use of suitable software.
3	Contents: Integral calculus: Definite and indefinite integral, main theorem of differential and integral calculus, mean value theorem of integral calculus, integration rules and methods. Differential equations: Basic concepts, classification, ordinary differential equations of first and second order, systems of linear differential equations with constant coefficients, complex numbers. Computer algebra: Use of a computer algebra system for problems from the areas of integral calculus and differential equations.
4	Forms of teaching: Lecture, seminar-based teaching
5	Participation requirements: Formal: None Content: Content of the lecture Mathematics 1 (1148)
6	Forms of assessment: Written examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. rer. nat. Martin Petry
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Mathematics 3					MA3
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1159	150 h	5	3rd semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The students know the basic concepts of vector analysis and numerical analysis. The students are able to analyse and solve simple technical problems from the field of mechanical engineering using the methods of vector analysis and numerical analysis, also by using suitable software. Students will be able to write and implement simple algorithms in a high-level programming language on a computer.	
3	Contents:	
	Vector analysis: Derivative of a vector, divergence, rotation, gradient, line, area and volume integrals, integral theorems of Gauss and Stokes. Numerics: Determination of zeros, differentiation and integration, solving systems of linear equations with iterative methods, solving ordinary and partial differential equations, implementation of algorithms in a higher programming language such as C, C++, FORTRAN, Java or MATLAB.	
4	Forms of teaching:	
	Lecture, seminar-based teaching	
5	Participation requirements:	
	Formal:	None
	Content:	Content of the lecture Mathematics 2 (1154)
6	Forms of assessment:	
	Written examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr. rer. nat. Martin Petry	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Molecular Materials					MOW
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1178	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students can select suitable molecular materials for special applications or evaluate suitable possibilities for modifying the materials for the intended use. In return, they have a profound understanding of the different possibilities of influencing the material behaviour by chemical or physical changes or by the addition of further substances in relation to the application. In addition, students can analyse ageing processes and propose/evaluate measures to prevent or delay them. Students understand the differences between so-called biopolymers, biological composites and petrochemical-based polymers.

3 Contents:

- Chemical structure and physical arrangement of macromolecules
- Ageing processes and stabilisation possibilities of polymer materials,
- Modification of specific material properties through fillers and reinforcing materials or nanoparticles, antistatic finishes
- Generating specific surface properties, such as self-cleaning, scratch resistance, metallic gloss, wettability, etc.
- Technical biopolymers, history, biodegradability, legal framework, testing, production and chemical structure, technical properties, end of life options, material manufacturers and types
- Biocompatibility
- Special cases of polymer materials and their use,
- polymers in medical technology
- Silicones
- Biological composites

4 Forms of teaching:

Lecture, exercise

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination, combination examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng.

9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Bruno Hüsgen
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Computational Fluid Dynamics 1					CFD1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1187	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The students know the basic concepts of computational fluid dynamics. Students will be able to analyse and solve simple flow problems using commercial tools. The students will also be able to implement simple simulation programmes in a high-level language.	
3	Contents:	
	Basics: Tensor calculus, stress tensor, Navier-Stokes equation, continuity equation, finite difference method, boundary conditions, grid types, streamfunction. Commercial tools: Introduction to flow simulation with a commercial CFD programme such as STAR CCM+ or ANSYS CFX. Software development: Implementation of a CFD programme in a higher programming language for simple flow problems, e.g. the Lid-Driven-Cavity or the Backward-Facing-Step Problem.	
4	Forms of teaching:	
	Lecture, seminar-based teaching	
5	Participation requirements:	
	Formal:	None
	Content:	Content of the lecture Fluid Mechanics (1252).
6	Forms of assessment:	
	Written examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr. rer. nat. Martin Petry	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Physics					PH
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1087	150 h	5	2nd semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: The students know the basic concepts as well as the importance of physics in the field of mechanical engineering. Students understand the most important equations of physics. The students are able to solve simple technical problems from the field of mechanical engineering using the methods of physics.
3	Contents: Basics: Significance of physics for the engineering sciences, working methods of physics, SI system, quantities, units, measurements Mechanics: Kinematics and dynamics of a mass point, Newton‘s laws of motion, work, energy, conservation laws of mechanics Electricity theory: Charge, electric field, electric field strength, electric potential, voltage, plate capacitor, current strength, magnetic field, magnetic flux density, Lorentz force, law of induction, coil, Ohm's law, Kirchhoff's rules, work and power in a DC circuit Optics: Geometrical optics, optical components, light as electromagnetic wave, refraction and dispersion
4	Forms of teaching: Lecture, seminar-based teaching
5	Participation requirements: Formal: None Content: Good basic knowledge of physics, mathematics I and II
6	Forms of assessment: Written examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Tobias Böhm
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Practical Project / Internship					PRA
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1292	450 h	15	7th semester	each semester	12 weeks

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	450	h
	Seminar lessons	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	In the practical project, the activities and learning outcomes imparted in the course of study are to be applied in a practice-oriented manner. To this end, students should work independently on engineering projects and develop suitable solution strategies. The main aim is to develop and expand integration, analysis and problem solving, presentation and communication skills.	
3	Contents:	
	The contents result from the field of activity of the respective chosen company or enterprise and should include an engineering task. At the end of the practical project, the supervising company is to prepare an activity report and the students a final report. During the practical phase, the students should receive individual and professional advising from the supervising university lecturers.	
4	Forms of teaching:	
	Seminar-based teaching with exercises as accompanying guidance	
5	Participation requirements:	
	Formal:	None
	Content:	None
6	Forms of assessment:	
	Term paper	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng., Mechanical Engineering B.Eng., Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Anton Klar	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Production Planning and Logistics					PPL
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1213	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students gain an insight into the tasks and methods of production planning, as far as it concerns questions of production process design, in particular production planning and control as well as supply chain management. They acquire knowledge about problems of design, planning, operation and controlling of production and logistics networks. Systematisation and formalisation in the context of supply chain management are taught for these problems.
Applications of methods for production and logistics networks, in particular for their structuring, dimensioning, planning and operation are given.
Questions that arise in the design and operation of logistics systems can be recorded and structured by students and the resulting sub-tasks can be provided with a solution (in the sense of a functional model) on the basis of a systematic problem description in the sense of an input/output system.

3 Contents:

The module teaches the most important basics and concepts for the design, the technical-organisational layout and the realisation of processes in production systems. The course will deepen concepts and procedures for planning and controlling the process in production systems in companies of different types (individual / small batch / series production). In addition, procedures, processes and methods of production logistics and supply chain management are covered. The students acquire competences for modelling and analysing complex decision-making situations that occur when determining efficient logistics.
The students are enabled to plan the logistics process based on the requirements of suppliers and customers on the one hand and the marketable logistics components on the other hand and to formalise the problems that arise.

4 Forms of teaching:

Lecture and seminar-based teaching, supplemented by workshops, project work, company visits, guest lectures

5 Participation requirements:

Formal:	None

	Content:	None
6	Forms of assessment: Term paper, written exam, combination exam, project work or oral exam	
7	Prerequisite for the award of credit points: Module examination pass	
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade: according to BRPO	
10	Module coordinator: Prof. Dr.-Ing. Magnus Horstmann	
11	Other information: Literature will be announced at the beginning of the course.	
12	Language: German	

Production Engineering					PRT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1214	150 h	5	3rd or 5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students:

- can define the basic terms of production engineering.
- can classify the most important manufacturing processes with regard to their process characteristics and limits as well as their advantages and disadvantages.
- have the ability to select suitable manufacturing processes for different tasks and to describe the respective processes.
- are able to determine process-specific characteristic values, to evaluate these competently and, with the help of the results obtained, to assess the various manufacturing processes with regard to their advantages and disadvantages.
- know the essential basics in the field of assembly technology and are able to evaluate and assess the economic and organisational framework conditions of assembly concepts.
- can select suitable measuring and testing equipment to characterise component properties.

3 Contents:

Application-relevant basics of industrially used manufacturing processes for the production, machining, assembly and testing of components made of metallic materials and plastics: Original moulding processes, forming processes, separating processes, joining processes, coating processes, assembly concepts, measuring and testing equipment

4 Forms of teaching:

Lecture, seminar-based teaching

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng. and Mechatronics B.Sc.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Magnus Horstmann

11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Process and Information Management					PIM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1227	150 h	5	3rd semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: Students gain a basic understanding of operational IT systems and applications.
3	Contents: After the basic concepts of computer science have been taught, procedures of information needs analysis and the classification of information systems are worked out. Furthermore, the following contents are taught: - Basics of programming, UML - Basics of IT systems in industrial application - Basics of process and information management - Process definitions and IT systems to support industrial manufacturing (ERP, MES, PLM, PDM, SCM) - Integration of IT systems - The Digital Factory - Perspectives and outlooks of the factory of tomorrow
4	Forms of teaching: Lecture / Seminar
5	Participation requirements: Formal: None Content: None
6	Forms of assessment: Written examination or oral examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Jürgen Sauser
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Quality Management					QM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1228	150 h	5	6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students:

- can define the basic terms of quality theory.
- can explain the basics of setting up a quality management system.
- can implement standard requirements for a quality management system in a familiar field of work by identifying requirements, formulating objectives and describing processes on the basis of the defined terms and principles of quality management.
- can apply basic methods from the sub-disciplines of statistics, methodical work, quality and economic efficiency.
- can classify the industrial application of quality methods and techniques in the product development process.
- are proficient in the essential quality methods and techniques, such as FMEA, QFD, Poka Yoke, SPC, inspection planning.
- can apply the above-mentioned quality methods and techniques in the relevant stages of the product creation process.
- can systematically determine, eliminate and avoid causes of defects by selecting and applying the methods for data collection, data analysis and cause determination that are suitable for the application purpose in order to later solve quality problems reactively and preventively.
- can assess the role of quality management in development, procurement and production.
- are able to analyse significant influencing variables and risks with regard to the quality level of a production.
- are able to evaluate and analyse quality data from production and derive measures for optimising the production process.
- can deduce the legal aspects of warranty and product liability.

3 Contents:

The students learn the basic principles of classical quality theory and quality management. Furthermore, the basics of the product development process and the quality management methods used in the series preparation, procurement, production/quality testing and field application phases are taught.

4 Forms of teaching:

Lecture, seminar-based teaching, supplemented by workshops, project

	work, company visits, guest lectures	
5	Participation requirements:	
	Formal:	None
	Content:	None
6	Forms of assessment: Term paper, written exam, combination exam, project work or oral exam	
7	Prerequisite for the award of credit points: Module examination pass	
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade: according to BRPO	
10	Module coordinator: Prof. Dr.-Ing. Magnus Horstmann	
11	Other information: Literature will be announced at the beginning of the course.	
12	Language: German	

Statics					STK
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1248	150 h	5	1st semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	Students learn the basics of mechanical modelling, procedures for analysing forces acting on and in mechanically loaded components and acquire an understanding of the structure of statically determined load-bearing structures with the aim of designing and analysing load-bearing constructions and machine components	
3	Contents:	
	1) Introduction, use of engineering mechanics, fields of application 2) Basics and axioms of statics, vector calculus, concept of force, momentum 3) Mechanical models and cutting principle 4) Central, non-central force system, equilibrium conditions 5) Focus 6) Trusses: static determinacy, bar forces 7) Beam structures: Bearing, bearing reactions, Gerber beams, three-hinged arches, internal forces and moments, individual forces and distributed loads, frames and arch beams 8) Adhesion and friction, screw and rope friction	
4	Forms of teaching:	
	Lecture, seminar in small groups	
5	Participation requirements:	
	Formal:	None
	Content:	Mathematics (trigonometry, vectors, systems of equations)
6	Forms of assessment:	
	Written examination or oral examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Paul Diekmann	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Control Technology					RT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1250	150 h	5	5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: The students are able to classify the most important control systems that occur in practice and to analyse their properties. They can apply the knowledge gained in this process with regard to the selection of a suitable control strategy. In addition, it is possible for them to systematically design control/regulation in the time or image and frequency domain. Furthermore, they are familiar with the basics of implementing/programming control and regulation algorithms.
3	Contents: - Introduction (definitions, standards, examples, design approach, objectives) - Binary controls (logic circuits, working with PLC, Prog. with FBD/AS) - Continuous transfer systems (classification, elementary transfer elements, block diagram, linearisation) - Description and analysis of LTI systems in the image and frequency domain (transfer function, frequency response diagrams, stability criteria) - Design of single-loop control loops (design requirements, setting rules, design in the image domain, design based on the frequency characteristics) - Application examples
4	Forms of teaching: Lectures with application examples and seminar-based teaching
5	Participation requirements: Formal: None Content: Lecture 'System and Measurement Technology' (1255)
6	Forms of assessment: Written examination or oral examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Klaus Panreck
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Structural and Design Development					SBU
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1253	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
1	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	Students learn how to design and optimise machine components and functional assemblies in accordance with their function and strength	
3	Contents:	
	Use creative methods to develop technical solutions, design and sketch principle solutions modelling kinematic movement sequences, component design suitable for production, taking into account material, shape and manufacturing restrictions. Optimisation using simulation techniques	
4	Forms of teaching:	
	Lecture, seminar in small groups, practical course	
5	Participation requirements:	
	Formal:	None
	Content:	Strength of Materials (1091) and Finite Elements 1 (1093)
6	Forms of assessment:	
	Written examination or oral examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Paul Diekmann	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Fluid Machinery					STMA
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1131	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Instrumental competence:
Application of the scientific principles using the example of fluid flow machines.
Systematic competence:
The fluid and thermodynamic as well as mechanical engineering problems occurring in fluid flow machines are to be recognised with certainty, are described, evaluated and solved and from this, well-founded own judgements are derived.
Independently recognise the interface problems or the interaction of the disciplines.
Communicative competence:
The students are able to present, perform and discuss their theoretical knowledge in oral or written presentations.

3 Contents:

Overview, turbomachine as black box, energy balance, turbomachine in the plant, hydraulic and thermal flow machines, velocity free corners, degree of reaction, Euler's turbine main glide,
Laws of similarity, flow in the blade channel, losses, guide vanes, hydrodynamic forces, cavitation, energy balances
Design and construction of pumps and industrial fans
Rotor, housing, bearing, shaft seals, vibration behaviour, difference between axial and radial pumps/ventilators
Operating behaviour and control
Profile design of pumps, turbines and compressors Selection of pumps/blowers
for a pipe network system
Plant characteristic curve – Bernoulli's theorem, pipe friction coefficient, Reynolds number, Moody diagram
Theory of nozzle and diffuser flow
Difference between static and total state variables (pressure, temperature, enthalpy,..)

4 Forms of teaching:

Lecture, seminar-based teaching and practical course

5 Participation requirements:

Formal: None

	Content:	Modules: 1048 Dynamics; 1087 Physics; 1152 Mathematics 2; 1158 Mathematics 3; 1267 Thermodynamics 1
6	Forms of assessment: Written examination	
7	Prerequisite for the award of credit points: Module examination pass	
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade: according to BRPO	
10	Module coordinator: Prof. Dr.-Ing. Jürgen Hermeler	
11	Other information: Literature will be announced at the beginning of the course.	
12	Language: German	

Fluid Mechanics					SM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1252	150 h	5	4th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The students know the basic concepts of fluid mechanics. The students are able to analyse and solve simple flow problems from the field of mechanical engineering.	
3	Contents:	
	Basic feature: Concept of fluid, particle and continuum model, mass density, viscosity, pressure, compressibility and coefficient of expansion, surface tension. Statics: Hydro- and aerostatics. Dynamics: Velocity field, trajectory and streamlines, mass and volume flow, mass flow density, Couette and Poiseuille flow, substantial derivative, Navier-Stokes equation, continuity equation, Bernoulli's law, Hagen-Poiseuille's law, rotating fluids, flow around bodies.	
4	Forms of teaching:	
	Lecture, seminar	
5	Participation requirements:	
	Formal:	None
	Content:	Content of the lectures Mathematics 1, Mathematics 2, Mathematics 3, Physics.
6	Forms of assessment:	
	Written examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr. rer. nat. Martin Petry	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

System and Measurement Technology					SUM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1255	150 h	5	4th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: Students are able to calculate the behaviour of systems and determine their parameters on the basis of measured system responses. They can evaluate measurement errors and carry out correction calculations if necessary. They also know how physical measurement signals are converted, processed and evaluated and which display devices are available and how they are operated. They also know the most important measurement methods of mechanical engineering and can apply them appropriately.
3	Contents: - Introduction (basic terms, standards, examples, aims of the lecture) - Basics of system description and analysis (differential equations and their solution by means of Laplace transformation, determination of characteristic values by means of step response, frequency response) - Measurement errors (causes, types of errors, normal distribution, error propagation) - Components of (analogue) measuring chains (transducer elements, bridge and amplifier circuits, multimeters, oscilloscopes) - Measuring methods (e.g. by means of strain gauges, for temperature, position) - Overview (Digital) Measurement Signal Processing
4	Forms of teaching: Lectures, seminar-based teaching and practical course
5	Participation requirements: Formal: None Content: Mathematics (differential equations, complex numbers). Physics (electricity)
6	Forms of assessment: Written examination or oral examination
7	Prerequisite for the award of credit points: Module examination pass and course assessment
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Klaus Panreck
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Didactics of Technology					EDU/TD
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1312	150 h	5	6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Seminar lessons	30 students	4	SCH	60	h	90	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students are able to

- formulate and justify the objectives, contents and standards of vocational education and training in the industrial-technical occupations in the context of the training objective,
- plan, prepare, implement and evaluate lessons,
- systematise the methods and media specific to teaching, select and use them according to content and target group,
- incorporate the special scientific features of mechanical engineering and electrical engineering into the didactic concept,
- plan, implement and subsequently reflect on a teaching sequence,
- structure subject content in a learning-area-oriented manner and transform it didactically,
- select suitable forms of examination and justify the selection.

3 Contents:

- Educational objectives and standards, framework curricula and training plans, guidelines,
- Didactic principles of the vocational fields of study (e.g. learning field concept in mechanical and electrical engineering occupations)
- Theories, models, methods and media (e.g. planning of teaching and learning processes, problem-solving strategies in activity-oriented teaching)
- Use of communication, presentation and learning techniques.

4 Forms of teaching:

Seminar lessons

5 Participation requirements:

Formal:	
Content:	

6 Forms of assessment:

Performance test

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Electrical Engineering B.Eng. and Mechanical Engineering B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Thorsten Jungmann

11 Other information:

12	Language: German

Technical English					TE
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1262	150 h	5	4th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Seminar lessons	30 students	4	SCH	60	h	90	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: - Subject-related: Students demonstrate that they have extended their active general language competence. They possess a sound basic vocabulary of Technical English and master the contextually relevant grammar. They communicate spontaneously and fluently in engineering job situations. They formulate issues confidently, clearly and in detail in English both in speaking and writing. - Social competence: They try out and consolidate communicative key skills in English presentations, teamwork and project work. - Methodological competence: They use targeted strategies for content acquisition and critical analysis of technical texts and for solving contextual tasks.
3	Contents: - The students can describe relevant engineering disciplines. - They master the core terminology of the technical topic (e.g. base units in engineering; dimensions and shapes; mathematical operations; forces and mechanisms; properties of materials; manufacturing and automation; energy and electricity; logistics; data processing and transmission). - They possess interdisciplinary skills (presentation techniques and project presentation, describing graphs, charts and diagrams, writing reports and abstracts)
4	Forms of teaching: Seminar-based teaching / individual and group work, etc. Project task (Assignment)
5	Participation requirements: Formal: None Content: None
6	Forms of assessment: Combination examination
7	Prerequisite for the award of credit points: 70% attendance and active participation, passed semester project and written exam
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: OStR Cornelia Biegler-König
11	Other information: Literature will be announced at the beginning of the course. Textbook, additional materials, intranet self-study courses
12	Language: German

Technical Drawing					TZ
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1265	150 h	5	1st semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	1	SCH	15	h	22.5	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Instrumental competence:
Students can design and dimension components and assemblies, derive drawings and perform calculations manually and with the help of CAD systems. They can apply the methodological steps of product development.
In doing so, they design:

- Individual part drawings with the objectives of being function oriented, production oriented and assembly oriented.
- Assembly drawings for the integration of functionally suitable machine elements that meet the requirements.

Systematic competence:
Create complex designs independently and in a team, select and dimension the required machine elements
Communicative competence:
Present found constructive solutions adequately, explain them comprehensibly and defend them in front of a professionally competent audience.

3 Contents:

- Principles of geometry
- Technical drawing
- Standardisation
- Representation of complete constructions in assembly drawings
- Representation of workpieces in individual part drawings
- Fundamentals of component modelling
- Drawing creation with CAD
- Elastic springs
- Screws

4 Forms of teaching:

Lecture, seminar, exercise

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written or oral examination; in each case with preliminary examination performance

7 Prerequisite for the award of credit points:

Module examination pass with preliminary examination

8 Application of the module (in the following study programmes)

	Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Inge Wickenkamp
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Thermodynamics 1					TD1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1267	150 h	5	2nd, 4th or 6th semester	Annual (Summer)	1 Semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Instrumental competence:
They are able to safely apply this knowledge of thermodynamics to technical issues.
Systematic competence:
It should be possible to recognise, describe and solve thermodynamic problems occurring in technical situations.
Communicative competence:
They have a communicative command of thermodynamics, can explain them argumentatively to experts and beginners and confidently present and defend questions of an unknown nature.

3 Contents:

- Basic concepts such as system, equilibrium, state variables, changes, processes, thermal and caloric state variables, process variables work and heat
- 1st law of thermodynamics: stationary / moving closed systems, stationary flow processes
- Ideal gases: Thermal / caloric equation of state of ideal gases, specific heat capacity, simple changes of state of ideal gases
- 2nd law of thermodynamics: Meaning, entropy
- Circular processes: simple reversible comparative processes of ideal gases: Carnot, Joule, petrol and diesel process. Terms: Work, performance, degree of effectiveness
- Real fluids, changes of state in the two-phase region, representation in various diagrams, material data calculations and tables
- Fundamentals of heat transfer

4 Forms of teaching:

Lecture and seminar

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Electrical Engineering B.Eng., Mechanical Engineering B.Eng. and Renewable Energies B.Eng.

9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. Peter Charles
11	Other information: Literature will be announced at the beginning of the course. Renewable Energies study programme: Possible elective subject
12	Language: German

Thermodynamics 2					TD2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1268	150 h	5	3rd or 5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Instrumental competence:
They are able to analyse and design more complex thermodynamic processes for real gases and to confidently apply topic-specific issues.
Systematic competence:
It should be possible to recognise, describe and solve thermodynamic problems occurring in technical situations.
Communicative competence:
They have a communicative command of thermodynamics, can explain them argumentatively to experts and beginners and confidently present and defend questions of an unknown nature.

3 Contents:

- Mixtures and mixing processes
- Humid air: State variables, simple state changes, representation in the h,x diagram
- Circular processes of ideal gases with irreversibilities
- Design of large stationary engines and power plants
- Operating and partial load behaviour and availability requirements of combined heat and power plants
- Measures to increase the performance and efficiency of combustion engines
- Evaluation of thermodynamic processes
- Right-hand circular processes with vapours: Steam power process (Clausius Rankine process)
- Left-hand circular processes with vapours: Chillers and heat pumps
- Optimisation of circular processes
- Gas turbine and combined processes

4 Forms of teaching:

Lecture and seminar teaching

5 Participation requirements:

Formal:	None
Content:	Modules: 1267 Thermodynamics 1

6 Forms of assessment:

Written examination or oral examination

7 Prerequisite for the award of credit points:

	Module examination pass
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. Peter Charles
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Connecting Elements					VBE
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1271	150 h	5	2nd semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	1	SCH	15	h	22.5	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students:

- can describe the most important fastening elements, use them correctly and calculate and design them using engineering methods.
- acquire skills for the selection of suitable fasteners.
- are able to design selected fasteners, carry out strength calculations and verifications.
- learn how to integrate fasteners into an assembly group or machine.
- are able to select the shaft-hub connection that makes sense for the respective application and to design frequently used shaft-hub connections.
- can calculate bolt and pin connections and carry out strength verifications.

3 Contents:

- Basics of component modelling and drawing creation with CAD
- Bolt and pin connections
- Welded connections
- Soldered connections
- Adhesive connections
- Shaft-hub connections
- Mechanical joining methods
- Screw connections

4 Forms of teaching:

Lecture, seminar, exercise

5 Participation requirements:

Formal:	None
Content:	Statics (1248), Strength of Materials (1091)

6 Forms of assessment:

Written or oral examination; in each case with preliminary examination performance

7 Prerequisite for the award of credit points:

Module examination pass with preliminary examination

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng.

9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Michael Fahrig
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Displacement Machines					VMA
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1132	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Instrumental competence:
Application of the acquired basic knowledge using the example of piston machines and centrifuges with regard to mechanics, thermodynamics and design theory
Systematic competence:
Independent recognition of the interrelationships, introduced by the comprehension of executed piston machines and centrifuges. The mechanical and technical problems that occur should be safely identified, described, evaluated and solved. From this, scientifically sound judgements about the mode of action are to be derived and substantiated in further new applications, and interface problems identified.
Communicative competence:
Work on tasks in interdisciplinary teamwork.

3 Contents:

Expansion of the theoretically treated basic knowledge of fluid mechanics and thermodynamics as applied to reciprocating machines and centrifuges. Overview, comparative processes, properties and characteristic values of the real processes, characteristic diagrams of the machines and interaction with the machines to be driven or driving units, constructive structure with justification of executed constructions, here with reference to similar problems in general. Mechanical engineering, special features of compressors and reciprocating machines.
Basics of mechanical separation technology:
- Mixtures of substances
- Rheological material properties
- Sedimentation, Stokes' sinking rate
- Residual moisture, concentration determination

Design of centrifuges – decanters and separators
Process engineering of centrifuges – clarifiers, separators, ...
Vibration technology
Laws of similarity
Bearing construction and shaft sealing
Fluid mechanics

4	Forms of teaching:	
	Lecture, seminar-based teaching and practical course	
5	Participation requirements:	
	Formal:	None
	Content:	Modules: 1087 Physics; 1152 Mathematics 2; 1267 Thermodynamics 1 ;
6	Forms of assessment:	
	Written examination or oral examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr. Peter Charles	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Follow-up Project					VPR
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1274	150 h	5	5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	1	SCH	30	h	30	h
	Seminar lessons	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	3	SCH	30	h	60	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students are able to work on a task from the chosen specialisation by researching information about the specific question and breaking these questions down into subtasks. They form a working group and appoint persons responsible for the respective subtasks. They define the scope and the expected results. They present interim results and final results and document the entire project in the form of a scientific report.

3 Contents:

- Project management
- Create schedule
- Documentation techniques
- Presentation techniques
- Work on a current project in a small group (start phase: definition of the task, project work, documentation, project presentation)

4 Forms of teaching:

Lecture, practicals

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Project work

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Christoph Jaroschek

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

German

Elective Module					WM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
9016	150 h	5	4th/5th/6th semester	each semester	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students		SCH		h		h
	Seminar lessons	30 students		SCH		h		h
	Exercise	20 students		SCH		h		h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students		SCH		h		h
2	Learning outcomes/competences:							
3	Contents:							
4	Forms of teaching:							
5	Participation requirements:							
	Formal:							
	Content:							
6	Forms of assessment:							
7	Prerequisite for the award of credit points:							
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.							
9	Importance of the grade for the final grade:							
10	Module coordinator: Prof. Dr.-Ing. Bruno Hüsgen							
11	Other information:							
12	Language: German							

Material and Component Testing					WBP
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1278	150 h	5	3rd or 5th semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	2	SCH	30	h	45	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students are able to evaluate material parameters with regard to their significance for technical applications, taking into account the production of samples and the determination of parameters. For this purpose, students acquire knowledge about different testing and examination procedures. In addition, they can assess the transferability of material parameters to component design or component testing. The students are able to apply suitable test procedures for the analytical examination of component failures and material characteristics. They can systematically detect a component failure or analyse a sub-problem.

3 Contents:

- Importance of material and component parameters for design, simulation and production
- Legal regulations, standards, directives, customer requirements, specifications and functional specifications
- Influence of specimen manufacture, specimen geometry, test method and test parameters on the characteristic values
- Technological, thermal, rheological, optical, acoustic and radiation-related as well as electrical and electromagnetic material and component testing,
- Material identification, chromatography, mass spectroscopy
- Methods for the investigation of ageing, weathering and media resistance
- Basics of damage analysis
- Measuring equipment/test gauge skills
- Design of experiments
- Problem-solving methods

4 Forms of teaching:

Lectures, exercises, practicals

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination, combination examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng. and Mechatronics B.Sc.

9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Bruno Hüsgen
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Materials Engineering					WT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1280	150 h	5	1st semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students understand the relationships between material structure and properties of metallic materials by:

- acquiring knowledge about the structure of materials and their modification by leaching elements
- understanding deformation behaviour as well as transformation behaviour and the phase reactions
- developing skills to apply and evaluate material parameters for different conditions of use and to transfer these to the component design
- gaining the competence to measure and evaluate material properties within the framework of a material test and to bring about changes in the material behaviour through heat treatment or mechanical deformation in a targeted manner.
- using the knowledge gained to select suitable materials for different applications.

3 Contents:

- Structure of metallic materials
- Lattice defects and their effect on material behaviour
- Deformation and fracture: Strength, toughness, deformability
- Alloy: State diagrams and iron-carbon diagrams
- Time-temperature transformation and austenitisation diagrams (ZTU, ZTA)
- Influence of selected alloying elements
- Heat treatments: Annealing, hardening & tempering
- Steel designations
- Properties and material behaviour of selected steel materials such as structural steels, tool steels, cast iron
- Material selection

Basic experiments on metallic materials are deepened in practical courses.

4 Forms of teaching:

Lecture, seminar-based teaching, practicals

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination or oral examination

7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Mechanical Engineering B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Thomas Kordisch
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Machine Tools					WM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1282	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	Students will be able to understand and evaluate the complex interrelationships that prevail in machine tools, plants and mechatronic systems. The understanding of mechanical, electrical and software aspects is a focus of this course and enables the student to understand any complex mechatronic systems. Subsequently, the production possibilities of mechatronic systems are analysed so that students can evaluate whether significant value creation can be realized.	
3	Contents:	
	Machine tools, plants, robots and artificial intelligence systems are fundamentally similar in structure. An understanding of stable foundations, rigid bearings and guides, correct drive concepts, applied control technology, adaptive and intelligent software systems is the focus of this course.	
4	Forms of teaching:	
	Lecture and seminar teaching	
5	Participation requirements:	
	Formal:	None
	Content:	None
6	Forms of assessment:	
	Written examination or oral examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	Mechanical Engineering B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Dragan Vucetic	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Heat Transfer					WÜT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1277	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	45	h
	Seminar lessons	30 students	2	SCH	30	h	45	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students are able to classify heat transfer issues, analyse processes and design systems by:

- gaining knowledge of the mechanisms of heat transfer and thereby
- developing the skills to apply this knowledge in design concepts and design calculations and thus
- building competences to analyse, calculate and evaluate the behaviour in different designs.

They can explain the applications of heat transfer in an argumentative manner.

3 Contents:

- Heat transfer
- Stationary, one-dimensional heat conduction: Fourier differential equation, solution for simple applications
- Thermal radiation
- Heat transfer coefficient: Calculation by means of dimensionless characteristic numbers: Reynolds, Prandtl and Nußelt number
- Heat exchanger: Construction types, design and recalculations
- Heat exchangers in power engineering
- Optimised heat transfer surfaces, e.g. through ribs
- Boiling and condensing

4 Forms of teaching:

Lecture and seminar teaching

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Mechanical Engineering B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr. Peter Charles

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

German