

Module: Instrumentation and Measurement

Level	Master	Short Name	IM
Responsible Lecturers	Hahn, Martin, Prof. Dr.-Ing.		
Department, Facility	Mechanical Engineering and Business Administration		
Course of Studies	Mechanical Engineering, Bachelor		
Compulsory/elective	Compulsory	ECTS Credit Points	4
Semester of Studies	5	Semester Hours per Week	4
Length (semesters)	1	Workload (hours)	120
Frequency	WiSe	Presence Hours	60
Teaching Language	English	Self-Study Hours	60

The following section is filled only if there is **exactly one** module-concluding exam.

Exam Type	Written Exam	Exam Language	English
Exam Length (minutes)	120	Exam Grading System	One-third Grades
Learning Outcomes	The students <ul style="list-style-type: none"> • are able to describe the physical operating principles of common sensor technologies • know the characteristics and performance parameters of sensors • measure physical phenomenon with proper sensors • address sampling and quantization challenges 		
Participation Prerequisites	<ul style="list-style-type: none"> • Basic circuits • System dynamics • Blockdiagram-based Modelling and Simulation 		

The previous section is filled only if there is **exactly one** module-concluding exam.

Consideration of Gender and Diversity Issues	<ul style="list-style-type: none"> ✓ Use of gender-neutral language (THL standard) ✗ Target group specific adjustment of didactic methods ✗ Making subject diversity visible (female researchers, cultures etc.)
Applicability	
Remarks	

Module Course: Instrumentation and Measurement (Lecture)

(of Module: Instrumentation and Measurement)

Course Type	Lecture	Form of Learning	Presence
Mandatory Attendance	no	ECTS Credit Points	2
Participation Limit		Semester Hours per Week	3
Group Size		Workload (hours)	60
Teaching Language	English	Presence Hours	45
Study Achievements ("Studienleistung", SL)		Self-Study Hours	15
SL Length (minutes)		SL Grading System	

The following section is filled only if there is a course-specific exam.

Exam Type		Exam Language	
Exam Length (minutes)		Exam Grading System	
Learning Outcomes			
Participation Prerequisites			

The previous section is filled only if there is a course-specific exam.

Contents	<p>This is a course in the modelling and selection of measurement devices and techniques in mechanical engineering design. steady-state and transient sensor performance characteristics, signal processing, and data acquisition techniques will be introduced.</p> <p>Topics are:</p> <ul style="list-style-type: none"> • Measurement Basics • Sensor Technologies • Sensor Dynamics • Sensor Characteristics and Calibration • Analog vs Digital • Sampling and Data Acquisition • Numerical Methods
Literature	<p>Morris, Alan S.; Langari, Reza: Measurement and instrumentation: theory and applications, Elsevier, 2nd edition, 2016.</p> <p>Northrop, Robert B.: Introduction to Instrumentation and Measurements, CRC Press, 3rd edition, 2014.</p>
Remarks	

Module Course: Instrumentation and Measurement (Practical Training)

(of Module: Instrumentation and Measurement)

Course Type	Practical Training	Form of Learning	Presence
Mandatory Attendance	yes	ECTS Credit Points	2
Participation Limit		Semester Hours per Week	1
Group Size		Workload (hours)	60
Teaching Language	English	Presence Hours	15
Study Achievements ("Studienleistung", SL)	Practical Training	Self-Study Hours	45
SL Length (minutes)		SL Grading System	Pass

The following section is filled only if there is a course-specific exam.

Exam Type		Exam Language	
Exam Length (minutes)		Exam Grading System	
Learning Outcomes			
Participation Prerequisites			

The previous section is filled only if there is a course-specific exam.

Contents	<p>The lab will be carried out with a changing selection related to the following topics:</p> <ul style="list-style-type: none"> • Incremental Encoders • Graphical User Interfaces and Instrumentation • Adapters • CAN-bus devices • 1st and 2nd order sensor response • Sensor calibration • Aliasing and Quantization
Literature	
Remarks	The prerequisite for successful participation is the completion of laboratory experiments and the preparation of suitable reports.