Valid from 2024.HS

Module description: Physical Principles of Sensor Technology

Module Code	t.BA.DSP.PGS.20HS
ECTS Credits	4
Language of Instruction/Examination	German
Organizational Unit	IAMP
Module Coordinator	Joanna Weng
Legal Framework	The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail.
Module Characteristic	Type 3a 2 lecture lessons per semester week and class+ 2 lab bi-weekly lessons per semester and half-class
Module Description	The physical principles of sensors are discussed, by means of various examples. Based on the laws of physics, the processes of measurement, the processing of raw data, and the relationship of this data to data-based models, are explored both theoretically and experimentally.
Module Content	**Introduction into sensors and measurement technology** **Relevance of sensors for data generation and interpretations of data based models** **Measurement uncertainty and error analysis** **Introduction into Physics basics** **Common measurands for the characterisation of systems (e.g. length, time, temperature, voltage, current etc.) as well as derived notions like energy or power** **Basic requirements and/or limitations to the design of measurements tasks. The usage of physical laws and effects is discussed by means of various examples.** **During the practical part of the course, different sensors are explored in the context of measurement tasks, and various procedures of data processing are implemented.**
Prerequisite Knowledge	Mathematics from the first year

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Learning Objectives (Competences)

Students...	Competencies	Taxonomies
The students are able to identify systematic and statistical errors of measurements and they know methods to estimate them. They master the basics of uncertainty analysis and they know statistical distributions and their relevance for measurement and data processing.	F, M	K2, K3
The students know the meaning of the most common measurands and their units (SI), which are used to characterise technical systems. Basic relations between the various measurands are known and can be utilised for computations (e.g. computation of power based on voltage and current).	F	K2, K3
The students are able to interpret spec sheets of sensors. They understand the concepts of digitalisation of measurement data and are able to design measurement tasks with suitable sensors, including reliability considerations.	F, M	K3, K4
The students understand measurement as interactions of systems under controlled usage of physical effects. They are introduced to a selection of examples, including statistical and quantum mechanical systems. The relations between models, measurements and real systems as well as the relevance of model reductions are recognised.	F, M	K3, K4, K5
The causes of measurement error, noise, drifts and cross-sensitivities are recognised and can be taken into consideration for data processing.	F, M	K2, K3

Performance Assessment

End-of-module exam	Assessment	Length (min.)	Weighting	Form
written exam	Grade	90	60	acc. to module agreement

Performance assessment during the semester	Assessment	Length (min.)	Weighting	Form
report	Grade	0	20	acc. to module agreement
written exam	Grade	45	20	acc. to module agreement

Classroom Attendance Requirement

None

Obligatory labs (2 labs, 2x 90 minutes), will be commuicated in the module agreement.

Learning material

Comments