Valid from 2024.HS

Module description: Electronics and Digital Technology: Basic Principles

Module Code	t.BA.ITP.GED.19HS
ECTS Credits	4
Language of Instruction/Examination	German
Organizational Unit	IAMP
Module Coordinator	Mathias Weyland
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 course familiarises students with the physical fundamentals of electrical engineering and computer technology. Besides theoretical knowledge, students will acquire practical skills, such as implementing and analysing electronic circuits.
Module Content	**Fundamentals (charge, force, energy, power, voltage)** **Current and Resistance (resistance, current, Ohm's Law)** **Circuits (circuits and Kirchhoff's Circuit Laws)** **Physical properties of reactive components (inductance, capacitance)** **Signals in the time- and frequency-domain (amplitude, frequency, bandwidth, qualitative fourier-transforms, spectrum)** **Reactive components and their role in computer science (step-response, high- and low-pass filters)** **Semiconductors (Working principles of diodes and transistors, push-pull and open drain output stages)** **Digital electronics (advantages of digital eoelctronics, logic gates, logic families and their properties, relation to boolean algebra, construction of D-flipflop from logic gates)** **Electric and magnetic fields** **Electromagnetic waves (relationship between frequency, wavelength and propagation velocity, refraction, reflection, dispersion, absorption in media (fiber etc.), attenuation, SNR.**
Prerequisite Knowledge	Keine

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Learning Objectives (Competences)

Students...	Competencies	Taxonomies
Students are familiar with the physical terms relevant for this class (charge, force, energy, power, voltage, current, resistance, inductance, capacitance) and understand how they relate to computer science.	M, F	K2, K3
Students are able to analyse circuits according to Kirchhoff's Circuit Laws	M, F	K2, K3, K4
Students are familiar with common waveforms and can use the corresponding terms (amplitude, frequency, bandwidth) correctly in the time- and in the frequency domain.	M, F	K2, K3
Students understand the advantages of digital electronics and know the properties of different logic families (in particular supply voltage, efficiency, propagation delays), and understand low logic gates are diesigned from transistors.	M, F	K2, K3
Students understand the working principles of a D-flipflop and are able to design such flipflops from logic gates.	F, M	K2, K3, K4
Students are familiar with the fundamentals of electric and magnetic phenomena and understand how they relate to computer science.	F, M	K2, K3
Students are familiar with the concept of electromagnetic radiation/waves (frequency, wavelength, propagation velocity) and understand the fundamental aspects of the propagation of such waves in media (refraction, reflexion, dispersion, absorption), in particular in optical fibers and network cables.	M, F	K2, K3
Students are abple to compute attenuation and signal-to-noise-ratio (SNR) in decibels and have an intuition for the decibel scale.	M, F	K2, K3, K4
Students are able to assess the order of magnitude of physical quantities and the plausibility of their results. Furhtermore, students are familiar with the equipment used in the lab sessions (power supply, multimeter, oscilloscope, function generator) and can use them for simple measurements.	M, SO, F	K1, K2, K3, K4, K5, K6

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Performance Assessment

End-of-module exam	Assessment	Length (min.)	Weighting	Form
written exam	Grade	90	70	acc. to module agreement

Performance assessment during the semester	Assessment	Length (min.)	Weighting	Form
written exam	Grade	15	15	acc. to module agreement
report	Grade		15	acc. to module agreement

Classroom Attendance Requirement

None

Learning material

- Tipler, P. & Mosca, G. (2014). Physik: für Wissenschaftler und Ingenieure. 7 Edition. Heidelberg, Deutschland: Springer Spektrum. ISBN 978-3827419453. eBook is available in the ZHAW library.
- Slides and lecture notes

Comments