Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Elektronik
Code der Lehrveranstaltung	42428
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	
Sprache	Italienisch
Studiengang	Bachelor in Elektrotechnik und Cyber-Physische Systeme
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	Prof. Luisa Petti, Luisa.Petti@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/39580 dr. Giuseppe Ciccone, Giuseppe.Ciccone@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/49145 Dott. Alessandro Torrisi, Alessandro.Torrisi@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/49858
Wissensch. Mitarbeiter/Mitarbeiterin	Dott. Alessandro Alleva
Semester	Alle Semester
Studienjahr/e	2
KP	12
Vorlesungsstunden	72
Laboratoriumsstunden	48
Stunden für individuelles Studium	180

Vorgesehene Sprechzeiten	36
Inhaltsangabe	M1 • Fundamentals of electrical engineering: electrical quantities, concept of bipoles and quadripoles; ideal and real generators; Kirchhoff's laws. • Resistive circuits and adynamic bipoles: resistive bipoles and Ohm's law; Thevenin's and Norton's equivalent circuits; nodal analysis and circuit simplification; superposition principle. • Dynamic circuits and transient response: introduction to dynamic bipoles; first and second order circuits; transient response and time-domain analysis. • Sinusoidal circuit analysis: superposition in AC circuits; multi-frequency circuits and signal decomposition; Thevenin's and Norton's models in AC; nodal analysis in sinusoidal regimes. • Power in sinusoidal mode: instantaneous and average power calculations; root mean square (RMS) values, complex power and power factor considerations. • Biports and circuit interconnections: biports and their characteristics; connection methods and practical applications; analysis of biport circuits in both dynamic and sinusoidal regimes • Operational amplifiers: principles and working of op-amps; circuit configurations and feedback mechanism; analysis of op-amp circuits in dynamic and sinusoidal conditions. • Frequency response and filters: transfer function and system behaviour; Decibel scale and Bode diagrams; design and analysis of filters. • Circuit simulation with SPICE: introduction to SPICE as a simulation tool; modelling and analysis of electrical components; practical applications in circuit design. M2 • Diodes: models, rectifier circuits, diode-based voltage regulators, limiting and clamping circuits. • Operational amplifiers: advanced circuits, difference amplifiers, integrators and differentiators, Op-Amp filters and non-idealities, positive feedback. • MOSFET and BJT models: physical structure, I-V model, C-V model, parasitic capacitances and resistances, small-signal models,

	p-channel MOSFET, pnp BJT. • Transistor amplifiers: basic principles, basic configurations, biasing networks, discrete-circuit and IC amplifiers. Differential amplifiers: differential pair. • Frequency response: low- and high-frequency responses, high-frequency response of MOSFET amplifiers. • Digital logic circuits: elements of Boolean algebra and combinatorial logic. CMOS logic circuit topologies, dynamic operation, and power dissipation.
Themen der Lehrveranstaltung	M1 • Fundamentals of electrical engineering: electrical quantities, concept of bipoles and quadripoles; ideal and real generators; Kirchhoff's laws. • Resistive circuits and adynamic bipoles: resistive bipoles and Ohm's law; Thevenin's and Norton's equivalent circuits; nodal analysis and circuit simplification; superposition principle. • Dynamic circuits and transient response: introduction to dynamic bipoles; first and second order circuits; transient response and time-domain analysis. • Sinusoidal circuit analysis: superposition in AC circuits; multi-frequency circuits and signal decomposition; Thevenin's and Norton's models in AC; nodal analysis in sinusoidal regimes. • Power in sinusoidal mode: instantaneous and average power calculations; root mean square (RMS) values, complex power and power factor considerations. • Biports and circuit interconnections: biports and their characteristics; connection methods and practical applications; analysis of biport circuits in both dynamic and sinusoidal regimes • Operational amplifiers: principles and working of op-amps; circuit configurations and feedback mechanism; analysis of op-amp circuits in dynamic and sinusoidal conditions. • Frequency response and filters: transfer function and system behaviour; Decibel scale and Bode diagrams; design and analysis of filters. • Circuit simulation with SPICE: introduction to SPICE as a simulation tool; modelling and analysis of electrical components; practical applications in circuit design.

	M2 • Diodes: models, rectifier circuits, diode-based voltage regulators, limiting and clamping circuits. • Operational amplifiers: advanced circuits, difference amplifiers, integrators and differentiators, Op-Amp filters and non-idealities, positive feedback. • MOSFET and BJT models: physical structure, I-V model, C-V model, parasitic capacitances and resistances, small-signal models, p-channel MOSFET, pnp BJT. • Transistor amplifiers: basic principles, basic configurations, biasing networks, discrete-circuit and IC amplifiers. Differential amplifiers: differential pair. • Frequency response: low- and high-frequency responses, high-frequency response of MOSFET amplifiers. • Digital logic circuits: elements of Boolean algebra and combinatorial logic. CMOS logic circuit topologies, dynamic operation, and power dissipation.
Stichwörter	Electrotechnics, Electronics, Electronic Circuits
Empfohlene Voraussetzungen	Mathematical Analysis I, Linear Algebra, Physics I, Physics II (For M1) + Mathematical Analysis I, Linear Algebra, Physics I, Physics II, Electronic Devices (for M2)
Propädeutische Lehrveranstaltungen	none
Unterrichtsform	Frontal lectures & labs/workshop.
Anwesenheitspflicht	Attendance is not compulsory, but highly recommended as many labs require adequate software and hardware infrastructure; non-attending students may contact the lecturer at the start of the course to get support on the modalities of the independent study
Spezifische Bildungsziele und erwartete Lernergebnisse	M1: Knowledge and understanding The student knows the concept of a circuit model and its fundamental components as well as the fundamental laws and theorems (including their limits of validity) necessary to analyze a circuit. Applying knowledge and understanding

	The student is able to use the knowledge acquired to create circuit models and analyze circuits. Making judgments The student is able to select from the various tools provided by the course those most suitable for achieving the objectives in terms of modeling and analysis of electrical circuits. Communication skills The student is able to present the competencies acquired with vocabulary appropriate to the topic. Learning skills The student is able to use the tools and reasoning techniques acquired to extend his/her knowledge. M2 Knowledge and understanding in the field of: Thanks to training in Electronic Engineering, graduates in Electronic and Cyber-Physical Systems Engineering will be able to: know and understand the fundamental principles, techniques and methods of designing, prototyping and testing basic analog and digital electronic circuits; Applying knowledge and understanding Ability Thanks to training in Electronic Engineering, graduates in Electronic and Cyber-Physical Systems Engineering will be able to: - apply the knowledge of Electronics to analyze and understand the behavior of analog and digital circuits, using the most appropriate approximations; - carry out simple experimental activities on electronic systems, acquiring measurements relating to the system and its behavior. Making judgements The graduate has the ability to judge and discern between different solutions to problems, evaluating the alternatives and

	methodologies to be applied, regarding fundamental analog and digital electronic circuits. The graduate has the ability to participate in data collection, analysis and the formulation of critical judgments and project proposals. Communication skills The graduate is able to communicate, understand and process texts on technical issues. In this case, not only the contents of the essay will be evaluated, but also the candidate's synthesis, communication and presentation skills. Ability to learn The graduate acquires the methodological tools for study and further exploration, including independent study, and possesses the knowledge necessary to undertake subsequent levels of university education (master's degree or first-level master's program)
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	Written and oral exam, with written evaluation “in itinere” , possible project assignment for evaluation
Bewertungskriterien	The evaluation criteria will be: - the accuracy of the answers given in the written examination, with particular attention to the resolution procedure adopted and the formal correctness of the same. - The accuracy of the answers given in the oral examination, with particular attention to the terminology used.
Pflichtliteratur	M1: Circuiti elettrici”, Charles K. Alexander, Matthew Sadiku, Giambattista Gruosso, Giancarlo Storti Gajani.

	M2: Adel S. Sedra, Kenneth C. Smith, “Microelectronic Circuits,” Oxford University Press, 7th ed. (other editions are equally acceptable)
Weiterführende Literatur	Paul Horowitz, Winfield Hill, “The Art of Electronics”, Cambridge University Press, 2nd Edition (other new editions are equally acceptable)
Weitere Informationen	Assessment language: ITALIAN Software used: LTspice
Ziele für nachhaltige Entwicklung (SDGs)	Industrie, Innovation und Infrastruktur, Hochwertige Bildung

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Grundlagen der Elektronik
Code der Lehrveranstaltung	42428A
Wissenschaftlich-disziplinärer Bereich	ING-INF/01
Sprache	Italienisch
Dozenten/Dozentinnen	Prof. Luisa Petti, Luisa.Petti@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/39580 dr. Giuseppe Ciccone, Giuseppe.Ciccone@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/49145
Wissensch. Mitarbeiter/Mitarbeiterin	Dott. Alessandro Alleva
Semester	Erstes Semester
KP	6
Verantwortliche/r Dozent/in	
Vorlesungsstunden	36
Laboratoriumsstunden	24

Stunden für individuelles Studium	90
Vorgesehene Sprechzeiten	18
Inhaltsangabe	• Fundamentals of electrical engineering: electrical quantities, concept of bipoles and quadripoles; ideal and real generators; Kirchhoff's laws. • Resistive circuits and adynamic bipoles: resistive bipoles and Ohm's law; Thevenin's and Norton's equivalent circuits; nodal analysis and circuit simplification; superposition principle. • Dynamic circuits and transient response: introduction to dynamic bipoles; first and second order circuits; transient response and time-domain analysis. • Sinusoidal circuit analysis: superposition in AC circuits; multi-frequency circuits and signal decomposition; Thevenin's and Norton's models in AC; nodal analysis in sinusoidal regimes. • Power in sinusoidal mode: instantaneous and average power calculations; root mean square (RMS) values, complex power and power factor considerations. • Biports and circuit interconnections: biports and their characteristics; connection methods and practical applications; analysis of biport circuits in both dynamic and sinusoidal regimes • Operational amplifiers: principles and working of op-amps; circuit configurations and feedback mechanism; analysis of op-amp circuits in dynamic and sinusoidal conditions. • Frequency response and filters: transfer function and system behaviour; Decibel scale and Bode diagrams; design and analysis of filters. • Circuit simulation with SPICE: introduction to SPICE as a simulation tool; modelling and analysis of electrical components; practical applications in circuit design.
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Unterrichtsform	Frontal lectures & labs/workshop.
Pflichtliteratur	M1: Circuiti elettrici", Charles K. Alexander, Matthew Sadiku, Giambattista Gruosso, Giancarlo Storti Gajani.
Weiterführende Literatur	Paul Horowitz, Winfield Hill, "The Art of Electronics", Cambridge University Press, 2nd Edition (other new editions are equally acceptable)

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Entwurf Elektronischer Schaltungen
Code der Lehrveranstaltung	42428B
Wissenschaftlich-disziplinärer Bereich	ING-INF/01
Sprache	Italienisch

Dozenten/Dozentinnen	Dott. Alessandro Torrisi, Alessandro.Torrisi@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/49858
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
KP	6
Verantwortliche/r Dozent/in	
Vorlesungsstunden	36
Laboratoriumsstunden	24
Stunden für individuelles Studium	90
Vorgesehene Sprechzeiten	18
Inhaltsangabe	• Diodes: models, rectifier circuits, diode-based voltage regulators, limiting and clamping circuits. • Operational amplifiers: advanced circuits, difference amplifiers, integrators and differentiators, Op-Amp filters and non-idealities, positive feedback. • MOSFET and BJT models: physical structure, I-V model, C-V model, parasitic capacitances and resistances, small-signal models, p-channel MOSFET, pnp BJT. • Transistor amplifiers: basic principles, basic configurations, biasing networks, discrete-circuit and IC amplifiers. Differential amplifiers: differential pair. • Frequency response: low- and high-frequency responses, high-frequency response of MOSFET amplifiers. • Digital logic circuits: elements of Boolean algebra andcombinatorial logic. CMOS logic circuit topologies, dynamic operation, and power dissipation
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