Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
ING229-B	Analogical Electronics	3	2	2	2	4	7

Prerequisites	
Admission Requirements	

Language of Instruction	French
Course Type	Compulsory
Course Level	Bachelor Degree
Objective	-

Content	1. Review: Electric Circuits: Direct Current (DC) Circuits • Current, current density, and resistance (Ohm's Law) • Electromotive force (emf) and voltage • Kirchhoff's Laws (Junction and Loop rules) • Thevenin and Norton theorems 2. Transient Response • First and second-order circuits (RC, RL, and RLC) • Charge/discharge curves and time constant concept • Step and pulse responses of circuits 3. Alternating Current and Sinusoidal Steady-State • Complex numbers and phasor concept • Impedance and admittance • AC Power (Active, reactive, apparent power, and power factor) • Series and parallel resonance in RLC circuits 4. Frequency Response and Filters • Transfer function concept • Bode plots (Drawing and reading magnitude and phase curves) • Passive filter topologies: Low-pass, high-pass, band-pass, and band-stop filters • Cutoff frequency and bandwidth calculations 5. Fundamentals of Semiconductor Physics • Energy band structures of conductors, insulators, and semiconductors • Intrinsic semiconductors and electron-hole concept • P-type and N-type doping • P-N junction and depletion region formation 6. Diodes and Applications • Ideal and real diode characteristics (Current-Voltage, I-V curve) • Rectifier circuits: Half-wave and full-wave (bridge) rectifiers • Ripple voltage reduction with filter capacitor • Zener diodes and voltage regulation • Clipper, clamper circuits, and LEDs 7. Transistors • Bipolar Junction Transistors (BJT): NPN and PNP structures • BJT operating regions (Cutoff, Saturation, Active region) • BJT biasing circuits and DC load line • Transistor logic as a switch and amplifier • Introduction to Field Effect Transistors (FET/MOSFET) 8. Operational Amplifiers (Op-Amps) • Ideal Op-Amp characteristics and equivalent circuit • Negative feedback principle and virtual short circuit • Basic Op-Amp configurations: Inverting and non-inverting amplifiers • Adder, subtractor, and voltage follower (buffer) circuits • Integrator and differentiator circuits (Electronic equivalent of mathematical operations)
References	

Theory Topics

Week	Weekly Contents