Course **"Electronics for Physicists"** edition 2026, T.U. Delft

Lectures [8u45-12u45]**: 4th Nov. (lecture #1) -** building 22 (TNW) F005**, all other dates -** building 20, (Aula) hall D
Labs [13u45-17u30]: all dates - building 22 (TNW) room A151

Lect 1 Wed. Nov 4 morning Lecture + demo	**1: Introduction to electronics** Goal: send, receive, process information via voltage/current/charge/flux in circuits Basic components: Resistor, capacitor, inductor, diode, transistor, opamp. Concepts: feedback, circuit models and limitations. Practical basics for the afternoon lab: breadboards, soldering, equipment
Lab 1 Wed. Nov 4 afternoon Lab practice	**1:** Learn how to solder (even small surface mount components on a PCB) Build a charge detector, thermocouple amplifier, curve tracer, liquid level meter Use resonant LC-circuits to transmit/receive information
Lect 2 Wed. Nov 11 morning Lecture + demo	**2: Integrated circuits and design tools, analog and digital** Circuit simulation software tools (spice) and model-limitations. Prototyping and printed circuit boards : design, construction and build-limitations Digital electronics; logic functions, microprocessors, DSP, FPGA, development platforms
Lab 2 Wed. Nov 11 afternoon Lab practice	**2:** circuit simulation software: Simulate, build and measure a filter, see limitations. Make a stand-alone laser controller system using a microcontroller. Applications of development kits and FPGA/microcontrollerboards.
Lect 3 Wed. Nov 18 morning Lecture+demo	**3: Signals, noise, interference and shielding.** Description of signals, waveforms, rise time, bandwidth, slew rate, modulation Noise and interference, noise sources, interference sources, signal to noise ratio Shielding, cables, ground loop, Faraday cage
Lab 3 Wed. Nov 18 afternoon Lab practice	**3:** Search and identify interference with simple E/H probes Measure the effect of ground currents on signals in cables Build an optical link, identify interference, measure the rise time/bandwidth Determine signal to noise, make a resonant circuit. Shielding electric and magnetic fields, impedance of grounding wires
Lect 4 Wed. Nov 25 morning Lecture + demo	**4: RF and microwaves**. Transmission lines: introduction, models, standing waves, loss Scattering parameters: RF transmission/reflection in systems, cables and on PCB RF components and specifications: mixers, noise temperature, cryogenic application
Lab 4 Wed. Nov 25 afternoon Lab practice	**4:** Measure transmission line behavior in cables RF-applications of mixers : phase measurement, frequency doubler, demodulation Examine waveguide transmission versus coax lines Application: make a transmission line pulser
Lect 5 Wed. Dec 02 morning Lecture + demo	**5: Measurement: sensors, front-end and techniques** Sensors/transducers sensors, actuators, components (photodetectors), circuits Front-end amplifiers: instrumentation amp, IV-converter, iso-amp, rf (cryo) amplifier Define amplifier specs for a given measurement goal and test this. Filters: types, order, limitations and applications. Measurement techniques: bridge circuits, resonant circuits homodyning/heterodyning, time domain and frequency domain reflectometry
Lab 5 Wed. Dec 02 afternoon Lab practice	**5:** Build a capacitive bridge position sensor. Homodyning/heterodyning using mixer Build a reflectometry setup to detect cable and connector mismatch reflections. Use a Vector network Analyzer to read resonant ¼λ line , measure absorber effects Build and measure interference rejection filters
Lect 6 Wed. Dec 09 morning Lecture + demo	**6: Measurement equipment and setup** A to D conversion: specifications, limitations, use of subsampling and oversampling Equipment:, concepts, reading the spec sheet ,power supply, dc-measurements, Lock-in amp, DAQ-cards, Oscilloscope, spectrum/network analyzer, TDR, function/pulse/arbitrary/microwave generator, frequency vs time domain Controlling a measurement setup
Lab 6 Wed. Dec 09 afternoon Lab practice	**6:** Use a real lock-in amplifier, Use network/spectrum analyzer on resonant structures Digital oscilloscope: functions, tools, recognize sampling aliasing problems. Build and program a basic ultra-low budget DAQ system