

Electrical fundamentals	Electronics	Digital electronics and microcomputer technology	Building management systems	Power electronics	Communication technology	Measurement technology	Automation	Automotive technology	Automotive technology	Automotive technology	Basic equipment and accessories
DC technology CO4204-4D 1	Semiconductor components CO4204-5A 1	Gates and flip-flops CO4204-6A 1	Protective measures and power network types CO4204-4M	Self-commutated power converters CO4204-7M 2	Quadripoles and filters CO4204-9A 1	Measurement of electric values V/I/P/cos-phi/f CO4204-8A 2	Fundamentals of PLC technology CO4204-8M	DC and AC circuits in vehicles CO4204-7A 1	LIN bus CO4204-7E 2	Lidar system in motor vehicles CO4205-1E 1	Basic equipment and accessories Basic equipment CO4203-2A UniTrain interface CO4203-2A UniTrain measurement accessories (shunts, jumpers and connection cables) CO4204-2J Required accessories Depending on the course one or more UniTrain experimenters are required. 1 UniTrain experimenter (quantity) CO4203-2B Basic equipment EloTrain 2-mm plug-in system UniTrain interface CO4203-2A EloTrain experimenter CO4203-3B EloTrain measurement accessories (bridge connectors and connection cables) SO5146-1N Digital multimeter Max 10 LM2332 Recommended accessories UniTrain storage case CO4203-2Y Digital multimeter Multi 13S LM2330 LabSoft Classroom Manager LabSoft Classroom Manager SO2001-5A Collections of assignments (for use with Classroom Manager) SO2001-6A Electronics SO2001-6B Digital electronics SO2001-6C Electrical power engineering SO2001-6D Building management systems SO2001-6E Automotive technology SO2001-6F
AC technology CO4204-4F 1	Transistor multivibrators CO4204-5D 1	Sequential circuits CO4204-6C 1	Control systems/ protective circuitry CO4204-4N	Line-commutated power converters, 3-phase CO4204-7N 2	Active filters with operational amplifiers CO4204-9B 1	Measurement of non-electric values temp./pressure/force CO4204-8B 2	PLC model lift application CO4204-8T 1	Electronics and digital technology in vehicles SO4204-7B 1	CAN bus CO4204-7K 2	Gesture control and capacitive touchscreen in the motor vehicle CO4205-1U 1	
Three-phase technology CO4204-4H 1	Transistor and amplifier technology CO4204-5H 1	Application circuits CO4204-6E 1	LED lighting and colour detection CO4204-4P 1	Frequency converter drives CO4204-7P 3 Requires CO4204-7M and CO4204-7T	Coaxial cables SO4204-9G 1	Measurement of non-electric values displacement/angle/speed CO4204-8C 2	Sensors for automation CO4204-8U	Automotive electrical fundamentals CO4205-1G	CAN FD in automobiles CO4205-1S	Rear view camera with park assist CO4205-1C 1	
Magnetism/ electromagnetism CO4204-4A 1	Field-effect transistors CO4204-5K 1	Converter circuits CO4204-6B 1		Active power factor correction (PFC) CO4204-7Q 1	Signal transmission via optical fibres 650 nm / 820 nm CO4205-4E 2	RLC measurements CO4204-8D 2	Basics robot technology CO4204-3Q	PWM signals in automotive engineering CO4204-7J 1	Ethernet in motor vehicles CO4205-1A 3	Traffic sign recognition with speed control CO4205-1B 1	
Conducting measurements with the multimeter CO4204-4B 2	Operational amplifiers CO4204-5M 1	Fundamentals of computer technology CO4204-6H 1			Signal transmission via optical fibres 1300 nm CO4205-4F 1			Alternator / 3-phase generator CO4204-7D 2	48V sub-systems in on-board vehicle networks CO4205-1T	ACC with Emergency Brake Assist CO4205-1V 1	
Electrical network analysis CO4204-4C 1	Power semiconductor devices CO4204-5P 1	Supplement to CO4204-6H Applications and programming CO4204-6J 2						Sensors in motor vehicles CO4204-7F	Optical data buses for automotive applications CO4204-7H 1		
Electromagnetic compatibility (EMC) CO4204-4K 1	Analog power supplies CO4204-5R 1	EloTrain 2-mm plug-in system	Electrical power engineering	Electrical machines	4-wire lines SO4204-9F 1	Automatic control technology	Pneumatics / hydraulics	Pulse generation and ignition systems CO4204-7C	FlexRay CO4204-6Y	Comfort systems and keyless entry CO4204-6G 1 3*	
Measurements using an oscilloscope CO4204-4L 1	Switched-mode power supplies CO4204-5S 1	Introduction to digital technology SO4206-1F	Photovoltaics CO4204-3A	DC machines CO4204-7R 1	Pulse modulation methods PAM/PCM/Delta CO4204-9J 3	Practical introduction to control technology CO4204-8J	Pneumatics CO4205-5E	Common rail diesel injection system CO4204-6X	Autoshop communications and RFID CO4205-1N 2		
EloTrain 2-mm plug-in system	Circuit design using NI Multisim SO4204-5U 1	Sequential circuits SO4206-1G	Transient processes in DC and AC networks CO4204-3B 1	Asynchronous machines CO4204-7T 1	Pulse modulation methods, PTM CO4204-9K 1	Servo motor technology CO4204-8H	Electropneumatics CO4205-5F	Traction control systems ABS/ASR/ESP CO4204-6W	DC-AC conversion in vehicles CO4204-6L 1		
DC technology CO4206-1A	PCB layout with NI Ultiboard CO4204-5V	Microcontroller PIC16F887 (Assembler programming) SO4206-9A	Fuel cell technology CO4204-3C	Synchronous and slip-ring machines CO4204-7V 1	Modem methods ASK, FSK, PSK CO4204-9L 2		Hydraulics / electrohydraulics CO4205-8A	Wheel speed sensor technology CO4205-1F	Hybrid drives in automobiles CO4204-6V 3		
AC and three-phase technology CO4206-1B	EloTrain 2-mm plug-in system	8 Bit Microcontroller PIC (UML programming) CO4205-7F		Stepper motor CO4204-7W 1	AM / FM modulation / demodulation CO4204-9M 2			Airbag, belt tensioners and crash response CO4204-6Z 2	Interlock in hybrid and electric vehicles CO4205-1H 1		
	Semiconductors CO4206-1C	Arduino UNO (UML programming) CO4205-7G		Linear motor CO4204-7X	AM transmission and receiving technology CO4204-9N 3			EloTrain 2-mm plug-in system	Battery disconnect unit in hybrid and electric vehicles CO4205-1J 1		
	Basic electronic circuits CO4206-1D	Supplement to CO4205-7G Industrial interface CO4205-7W		Three-phase transformer CO4204-7Y 1	Data acquisition using RFID & NFC CO4205-4S 2			Fundamentals of electrical engineering in vehicles SO4206-1J	DC-DC step-up converters in hybrid and electric vehicles CO4205-1K 1		
	Optoelectronics CO4206-1E	16 Bit Microcontroller dsPIC (UML programming) CO4205-7C		BLDC / servo motors CO4204-7Z 1	Network technology and cybersecurity CO4205-4Q 2				DC-DC step-down converters in hybrid and electric vehicles CO4205-1L 1		
		32 Bit Microcontroller ARM (UML programming) CO4205-7D			Introduction to microwave technology SO4204-9U 1				Safe handling of HV systems CO4205-1M 1		
		Programming 32 Bit ARM Cortex M3 microcontroller (C programming) SO4206-9B			Supplement to SO4204-9U Waveguide components SO4204-9V				Fuel cell technology in vehicles CO4204-6M		
		DSP using microcontroller 32-Bit ARM Cortex-M3 (C programming) SO4206-9C			Antenna technology SO4204-9T 1				Solar technology in vehicles CO4205-1P		
		FPGA - Design of circuits using VHDL SO4206-9E			Supplement to SO4204-9T Complex antenna systems SO4204-9Z						
		FPGA Altera Cyclone IV (Verilog) CO4205-7E			Microstrip technology CO4204-9Y 1						

Representative

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* 3 experimenters are required for extension with CAN bus course (CO4204-7K)

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