Preparing your students for success

Mechatronics Resources

- 21st century learning
- Aligned to standards
- Knowledge and skills lessons

LJ CREATE™
Learning for life

Mechatronics Resources

for high school

Welcome

We're LJ Create, Education Specialists since 1979

Since 1979 we have been providing award-winning, world-class active learning solutions for technical education.

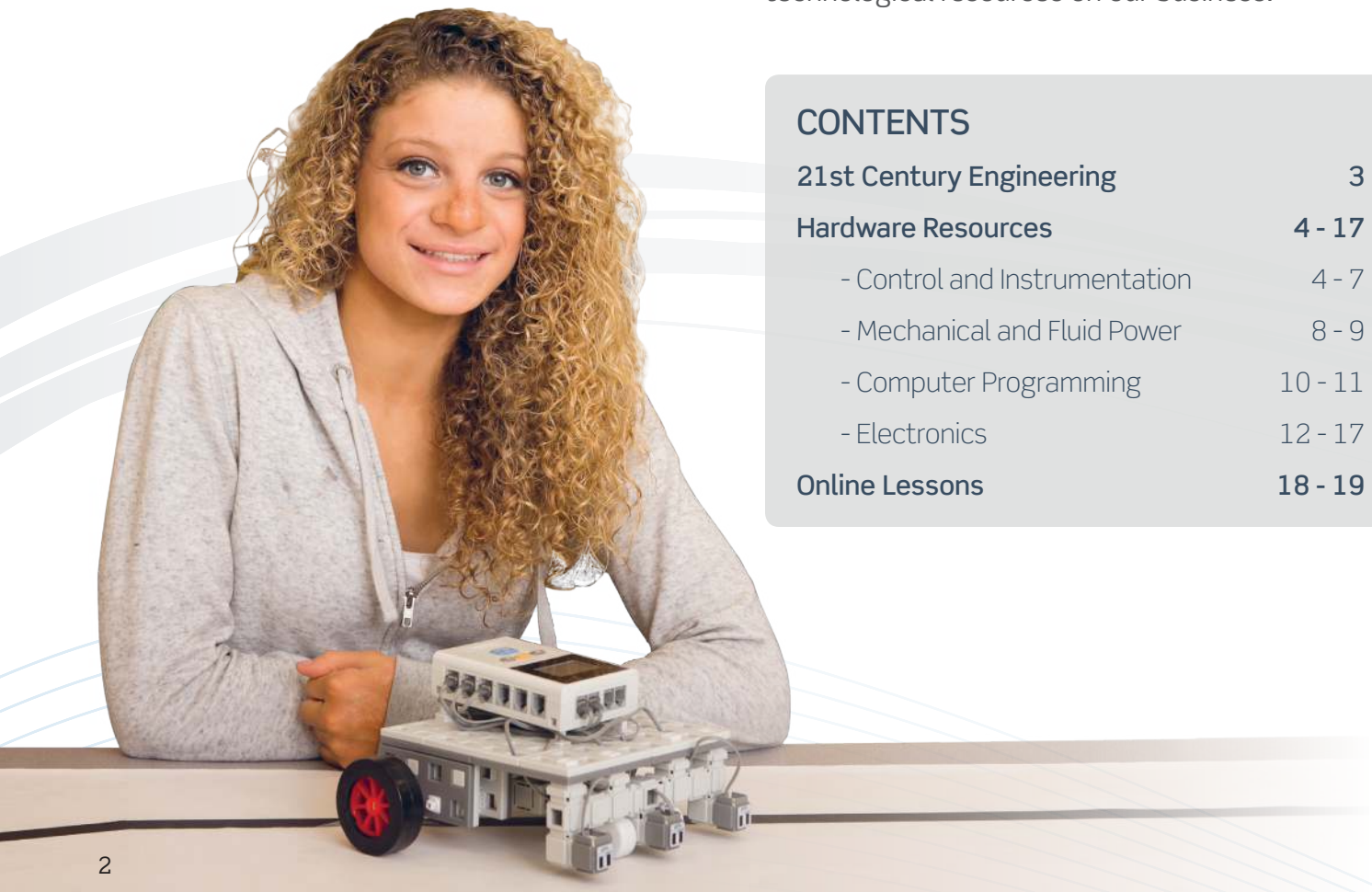
Today we create complete systems combining digital cloud content and tailor-made hardware kits that deliver innovative, inspiring learning in science, technology and engineering.

At LJ Create our mission is to enable learners throughout the world to achieve their full potential in a wide range of science and engineering areas by providing teaching solutions for schools and further education.

Our practical and innovative topic-specific solutions enable learners to achieve a firm foundation for their future, allowing them to grow and evolve in a way that meets their learning needs.

We help practitioners derive benefits in terms of learning outcomes and school management. We create more opportunities in science, engineering, and technology based curricula to enable learning for life.

Today LJ Create employs a diverse range of staff who are dedicated to our company vision, so we are able to impact considerable human and technological resources on our business.

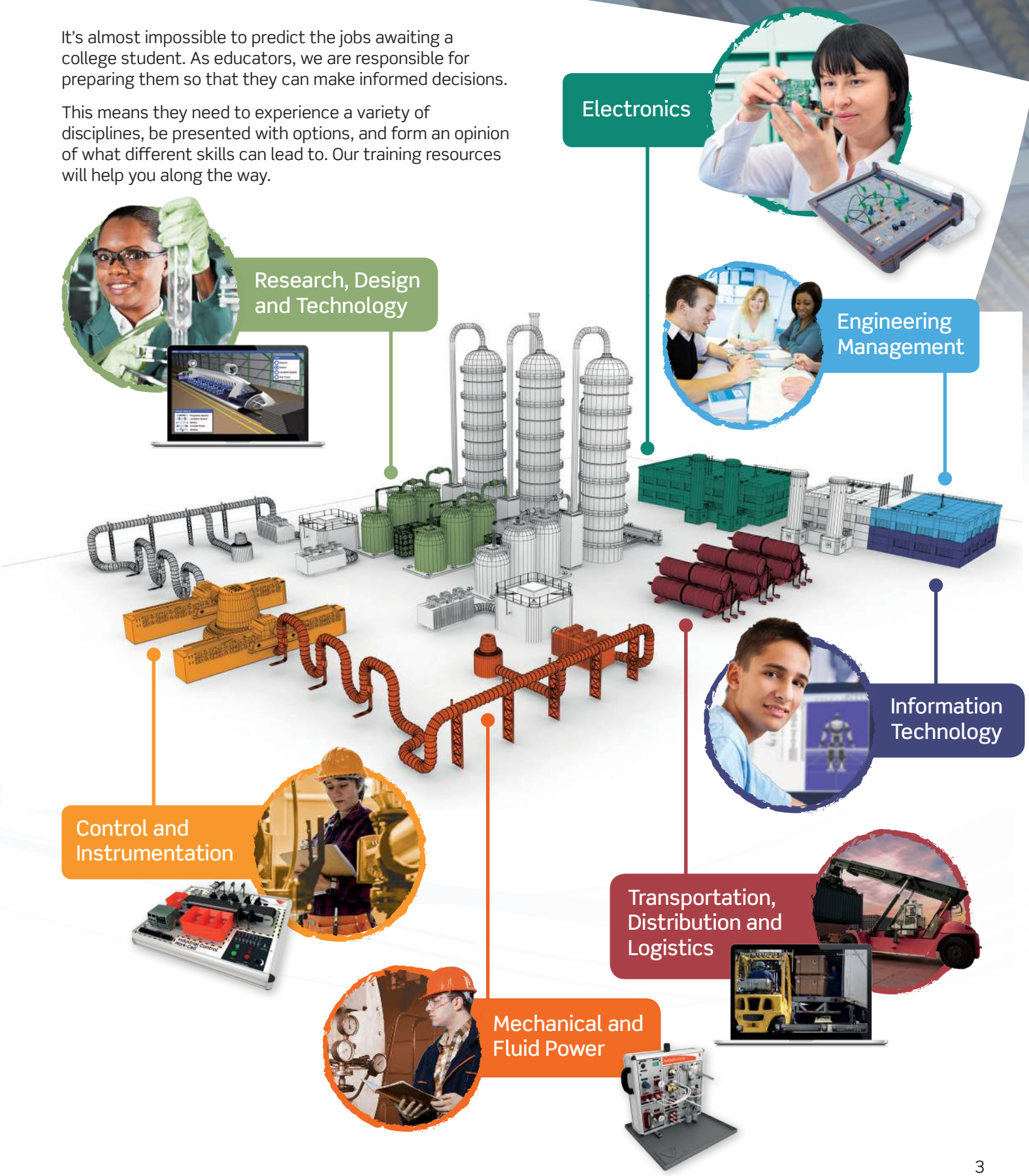


CONTENTS

21st Century Learning for Mechatronics Students

It's almost impossible to predict the jobs awaiting a college student. As educators, we are responsible for preparing them so that they can make informed decisions.

This means they need to experience a variety of disciplines, be presented with options, and form an opinion of what different skills can lead to. Our training resources will help you along the way.



Control and Instrumentation
Hardware

Industrial Control and PLC Trainer Teaching Set (290-00)

From beginner to expert, this teaching set brings a factory floor conveyor sorting system into the classroom. Students perform a comprehensive range of PLC programming tasks using a Siemens controller.

Our innovative simulation software is included to help introduce the basic concepts of PLCs and ladder logic. Programs developed by the student can be used to control either the hardware or the simulator.

Order as:

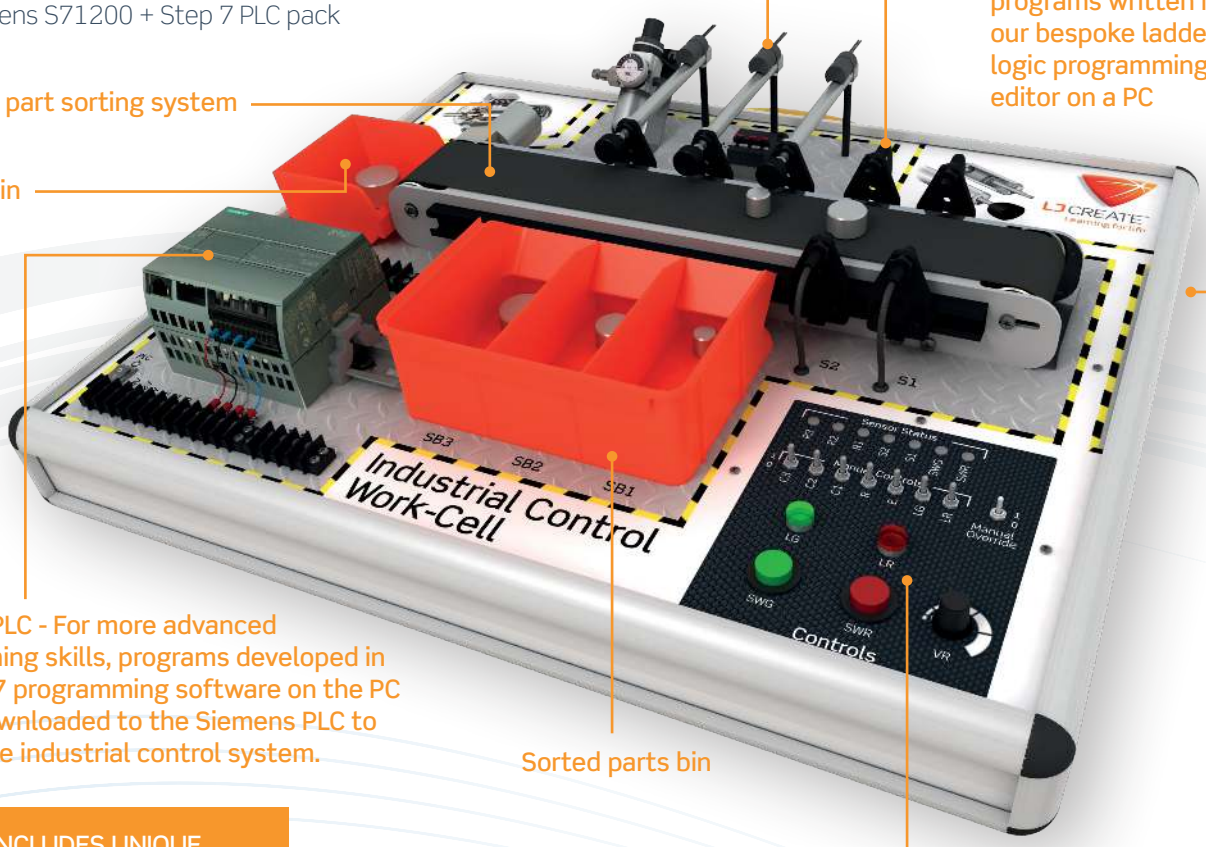
- 290-00 Industrial Control and PLC Trainer Teaching Set

Teaching set includes:

- 290-01 Industrial Control Trainer
- 290-02 Siemens S71200 + Step 7 PLC pack

Typical practical tasks and topics include:

- Industrial controllers
- Logic (AND, OR, NOT), truth tables and step logic
- Latching actuators
- Counting parts
- Timing events



3x Electro-pneumatic controlled cylinders

2x Infrared beam sensors for measuring part size

USB interface for direct control by programs written in our bespoke ladder logic programming editor on a PC

Conveyor belt part sorting system

Reject parts bin

Siemens PLC - For more advanced programming skills, programs developed in the Step 7 programming software on the PC can be downloaded to the Siemens PLC to control the industrial control system.

Sorted parts bin

Manual control panel with sensor status indication

INCLUDES UNIQUE SIMULATION SOFTWARE

PLCs Trainer Teaching Set (291-00)

From beginner to expert, the PLC training system offers a rotating disc sorting application to teach the fundamentals of PLC control. We also include our unique software simulation in the package to help introduce the basic concepts of PLCs and ladder logic.

Order as:

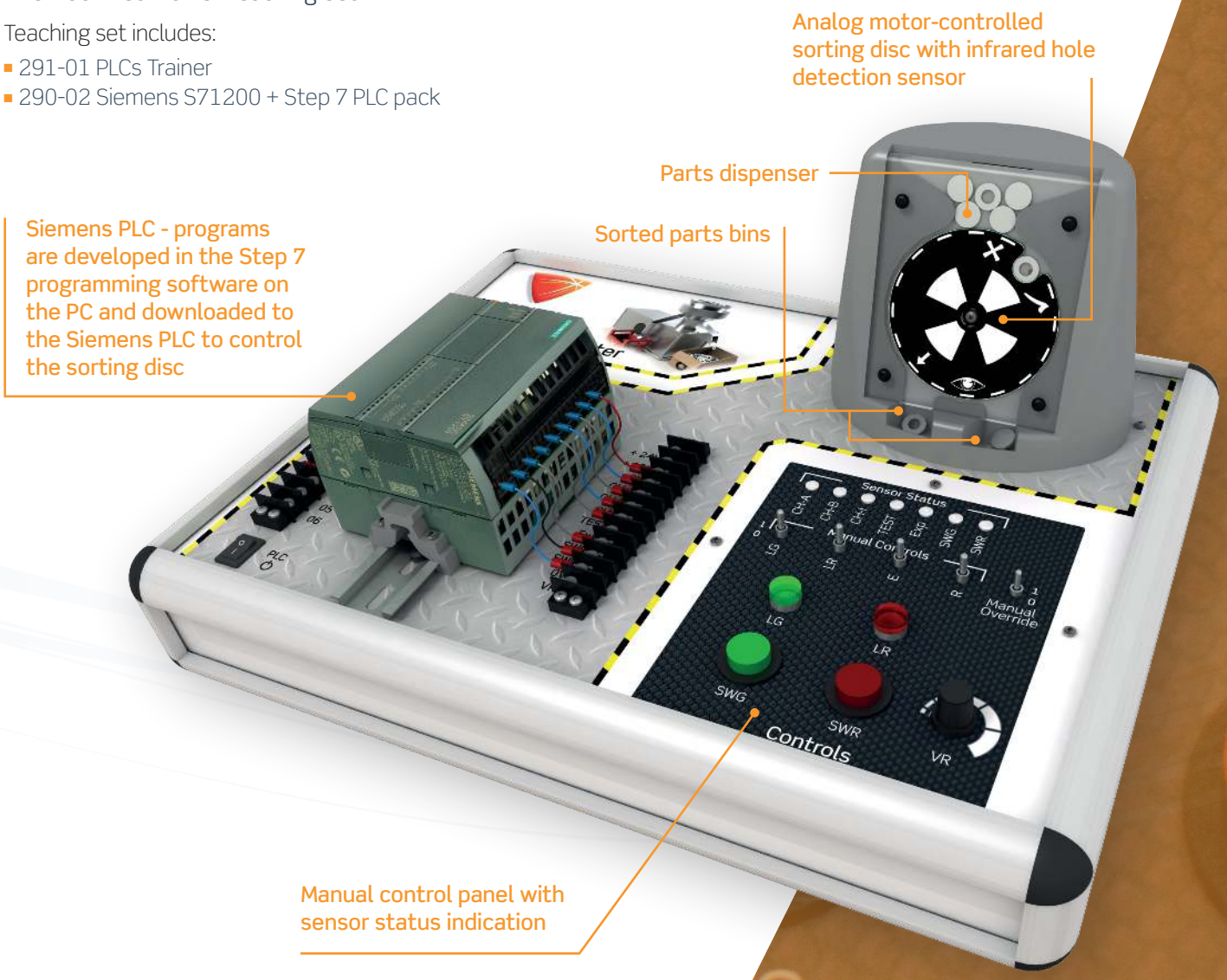
- 291-00 PLCs Trainer Teaching Set

Teaching set includes:

- 291-01 PLCs Trainer
- 290-02 Siemens S71200 + Step 7 PLC pack

Typical practical tasks and topics include:

- Create ladder logic programs
- Logic, truth tables and step logic
- Counting parts and timing events
- Analog input sensing
- Rotary encoder monitoring



Control and Instrumentation
Hardware

Transducers, Instrumentation and Control Trainer (217-50)

The Transducers, Instrumentation and Control Trainer introduces students to input sensors, output actuators, signal conditioning circuits and display devices through a wide range of hands-on practical activities.

Typical practical tasks and topics include:

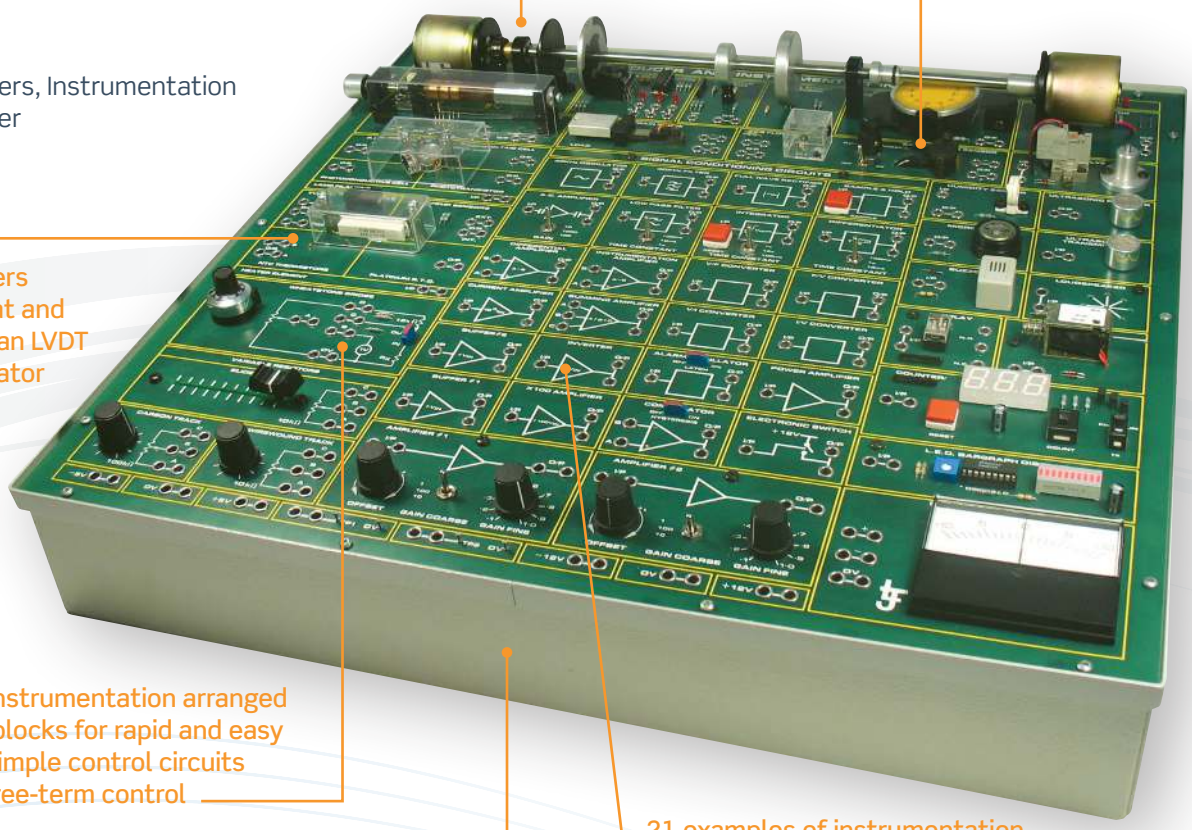
- Electronic switch
- Positional resistance transducers
- Wheatstone bridge measurements
- Temperature sensors
- Light measurement
- Environmental measurement
- Rotational speed or position measurement

Order as:

- 217-50 Transducers, Instrumentation and Control Trainer

Also available:

- 217-60 Data Acquisition of Control Systems (This is a virtual instrument unit that allows a PC to act as a set of test instruments. Instruments include an oscilloscope, multimeter, spectrum analyzer signal generator and data logger.)
- 217-00 Transducers, Instrumentation and Control Teaching Set (Includes 217-50 and 217-60)



Analog and Digital Motor Control Teaching Set (207-00)

This system provides the complete solution to teaching analog and digital motor control. The heart of the system is a mechanical unit which produces repeatable, text-book results every time.

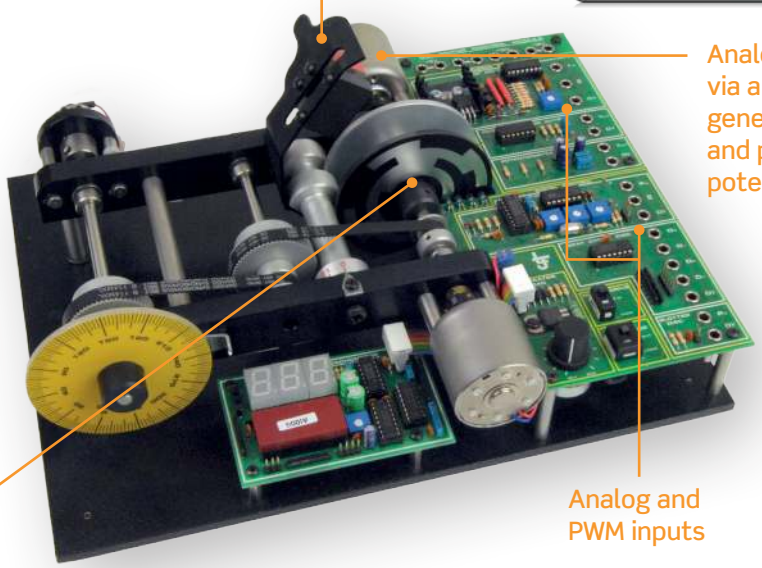
Order as:

- 207-00 Analog and Digital Motor Control Teaching Set

Teaching set includes:

- 207-02 Virtual Control Laboratory
- 207-03 Command Potentiometer
- 207-04 PID Controller Module
- 207-05 4mm Connection Lead Set
- 207-15 D.C. Motor Control Module
- 207-40 Power Supply Unit

Virtual control laboratory



Variable eddy current brake

Analog feedback via a tacho-generator and precision potentiometer

Digital feedback from Gray code and slotted discs

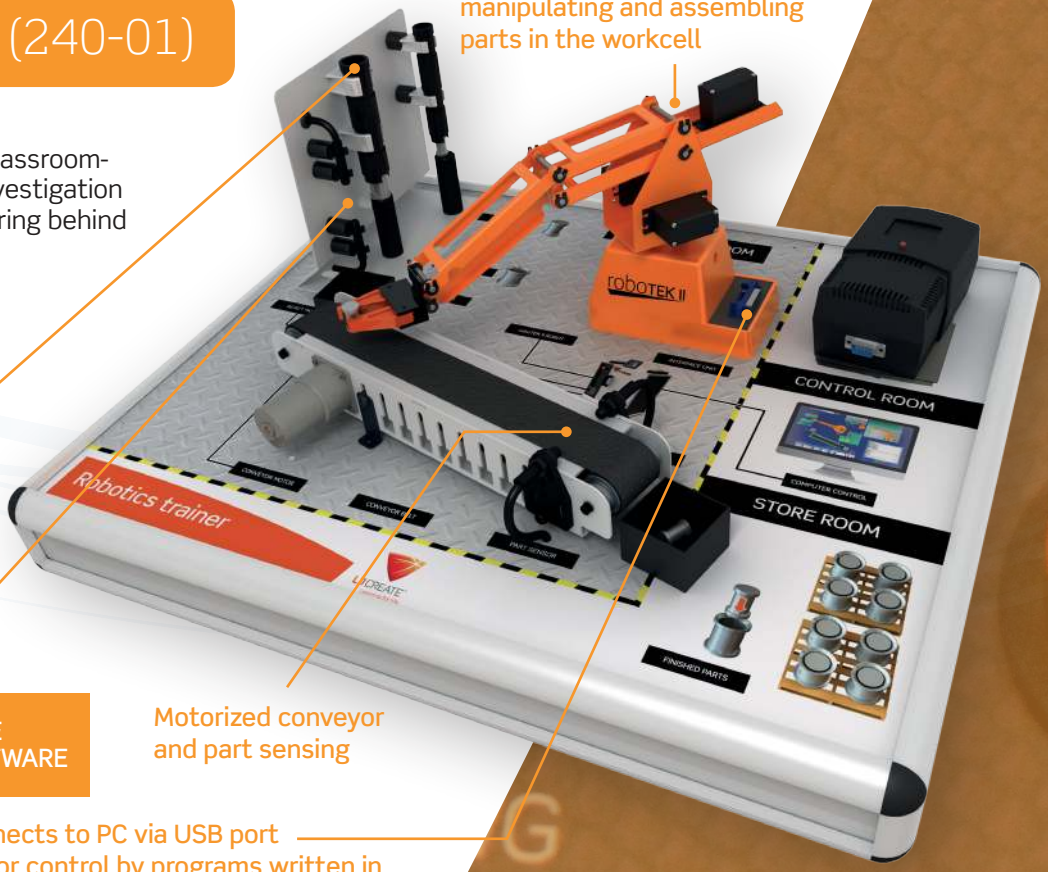
Analog and PWM inputs

Robotics Trainer (240-01)

The Robotics Trainer offers a classroom-based resource for practical investigation of the technology and engineering behind modern automated systems.

Order as:

- 240-01 Robotics Trainer



Articulated robot for manipulating and assembling parts in the workcell

Parts from the 2-component parts dispenser are collected by the robot arm

Part sensing to check for a hole in the container part

Motorized conveyor and part sensing

Robot connects to PC via USB port interface for control by programs written in our bespoke workcell programming editor

INCLUDES UNIQUE SIMULATION SOFTWARE

Mechanical and Fluid Power
Hardware

Hydraulics Trainer (280-01)

The Hydraulics Trainer offers a portable classroom-based resource for practical investigation of hydraulic components and systems. The trainer uses quick-release hydraulic hoses to allow rapid circuit connection and setup.

A Fluid Power Resource Pack is ideal for a whole-class introduction to fluid control using syringes and hoses.

Typical practical tasks and topics include:

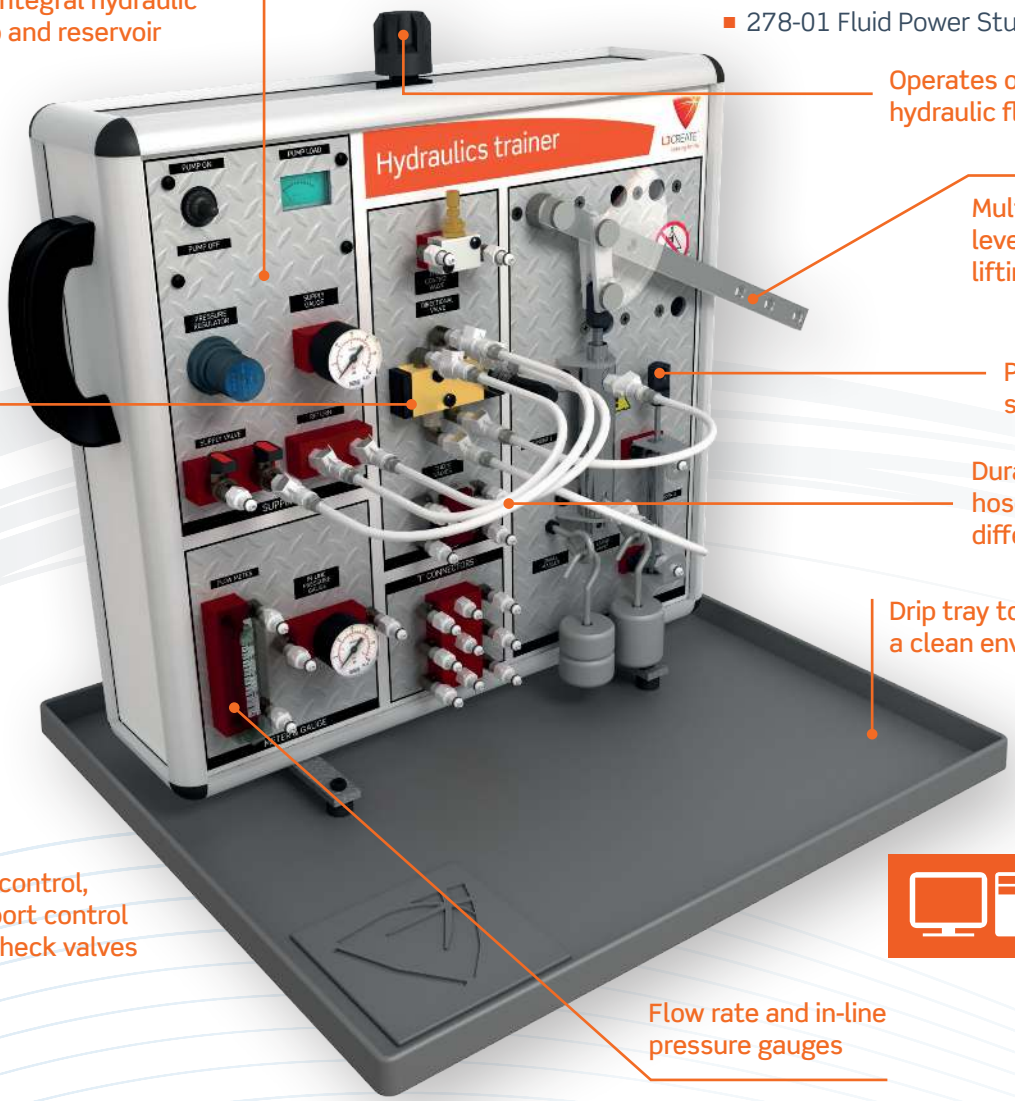
- Principles of hydraulics
- Valves and flow control
- Creating pressure with pumps
- Cylinder design

Order as:

- 280-01 Hydraulics Trainer

Also available:

- 278-01 Fluid Power Student Resource Pack



Fluid supply controls with integral hydraulic pump and reservoir

Operates on safe erifon-based hydraulic fluid

Multi-order configurable lever arm mechanism for lifting weights

Performance comparison of small and large cylinders

Durable, quick-release hoses for configuring lots of different hydraulic circuits

Drip tray to maintain a clean environment

Flow control, five-port control and check valves

Flow rate and in-line pressure gauges

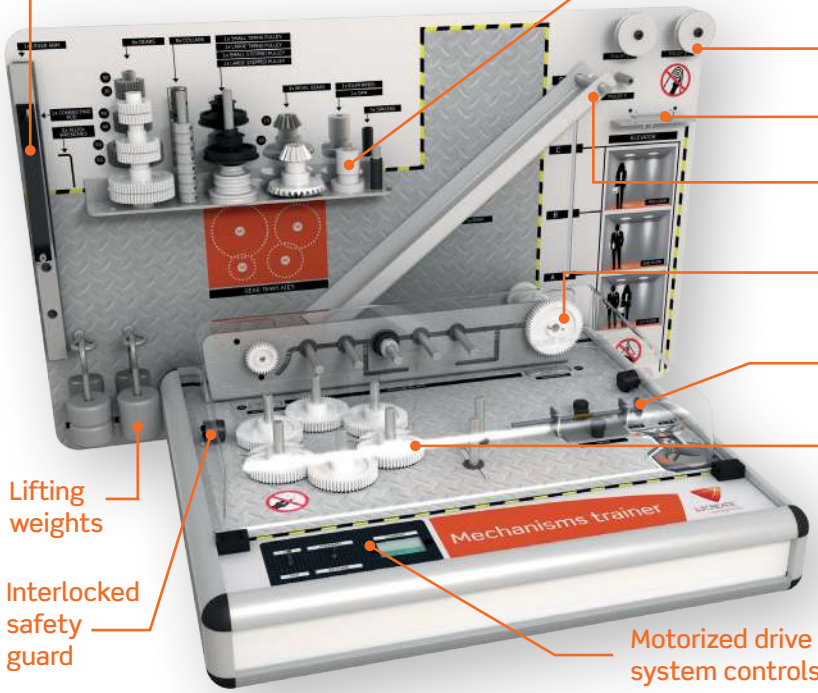
INCLUDES UNIQUE SIMULATION SOFTWARE

Mechanisms Trainer (260-01)

The Mechanisms Trainer offers a classroom-based resource for practical investigation of a variety of fundamental mechanical systems.

Order as:

- 260-01 Mechanisms Trainer



1st, 2nd and 3rd class levers

Integrated parts storage system

Pulleys

Lift mechanism interlock

Adjustable incline plane

Assembly of spur, bevel and compound gears

Rotary to linear motion mechanism

Pulley belt and toothed belt drive trains

Lifting weights

Interlocked safety guard

Motorized drive system controls

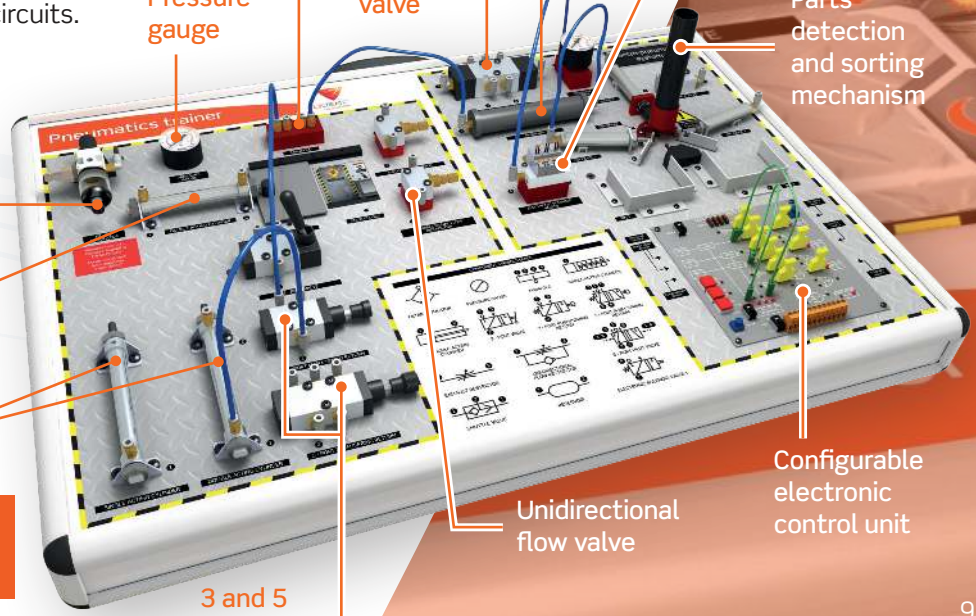
INCLUDES UNIQUE SIMULATION SOFTWARE

Pneumatics Trainer (270-01)

Offers a classroom-based resource for practical investigation of pneumatic components and systems. The trainer allows users to connect components to create fundamental circuits.

Order as:

- 270-01 Pneumatics Trainer



Manifold

Reservoir

5-port pilot valve

Pressure gauge

3x Electro-pneumatic valves

Parts detection and sorting mechanism

Air supply connection with filter regulator to run off supplied hand pump or external air supply

Door control mechanism

Single and double acting cylinders

Configurable electronic control unit

Unidirectional flow valve

3 and 5 port valves

INCLUDES UNIQUE SIMULATION SOFTWARE

Computer Programming
Hardware

Educational Robotics Invention Kit - ERIK (250-01)

The Educational Robotics Invention Kit provides students with an environment that motivates them to learn abstract computer science concepts in a bid to solve practical problems with physical outcomes.

The combination of engineering and programming creates a dynamic environment that helps students develop problem-solving skills that involve mathematics, engineering, science and logic.

Typical practical tasks and topics include:

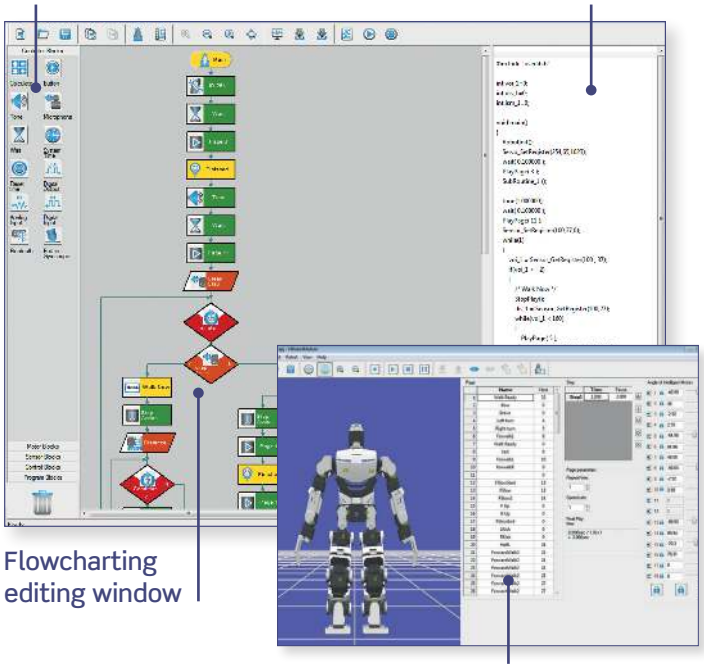
- Languages, machines and computation
- Testing and debugging
- A series of open ended design projects to allow students to get creative

Order as:

- 250-01 Educational Robotics Invention Kit

Block libraries

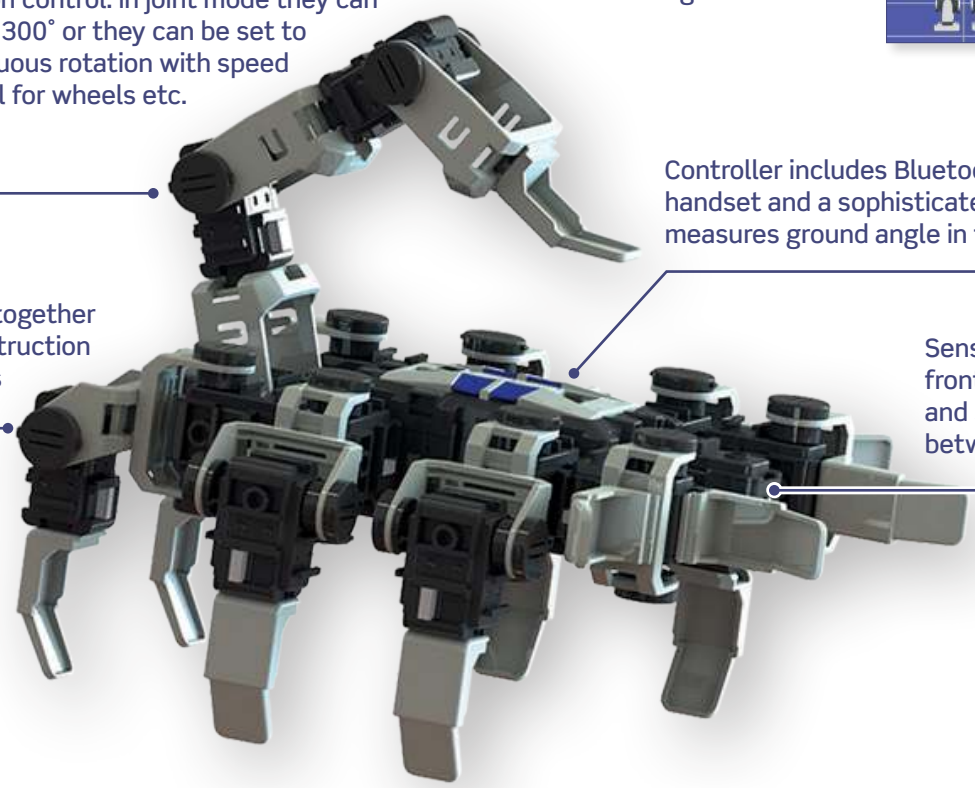
Coding window for creating programs in standard C language



Flowcharting editing window

Robot motion editing

Intelligent Servo Motors with speed and position control. In joint mode they can rotate 300˚ or they can be set to continuous rotation with speed control for wheels etc.



Controller includes Bluetooth communication to handset and a sophisticated gyroscope which measures ground angle in three dimensions

Clip-together construction parts

Sensor block measures side and front distance, light intensity and sound. It can differentiate between black and white.

Engineering Construction Kit (220-01)

The Engineering Construction Kit includes simple, yet sophisticated, programming software to allow students to design flowchart programs to bring their models to life.

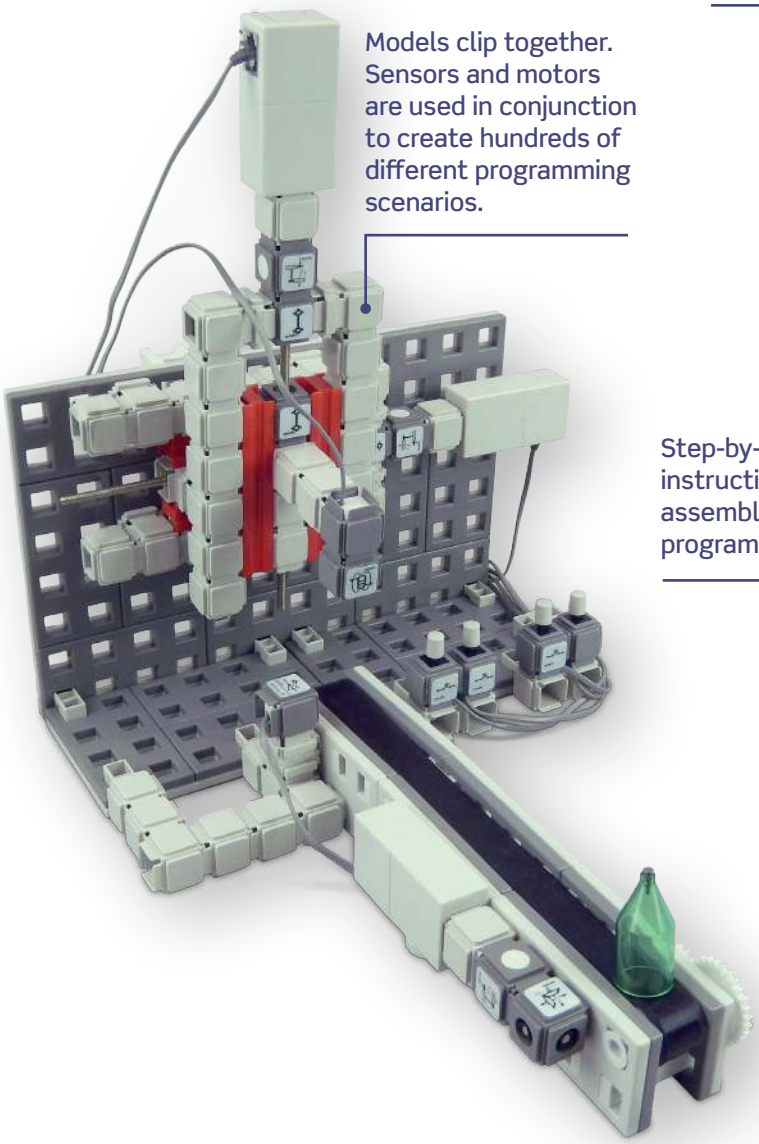
The Engineering Construction Kit is used to help students develop solutions to a range of practical real-world problem-solving tasks and activities within a classroom or lab environment.

Typical practical tasks and topics include:

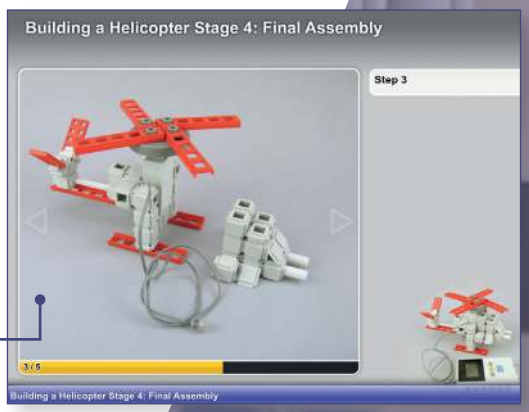
- Design a railroad crossing control system
- Design automated agricultural machines
- Design mobile robots

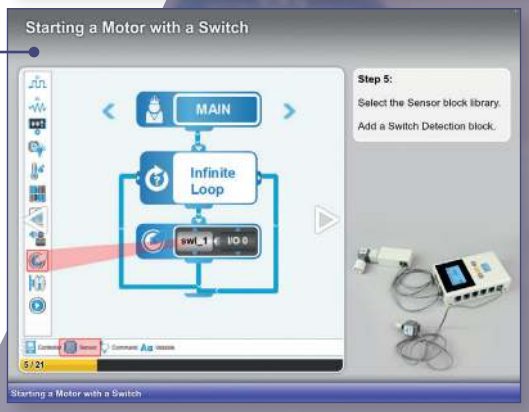
Order as:

- 220-01 Engineering Construction Kit



Step-by-step instructions for assembly and programming





Electronics
Hardware

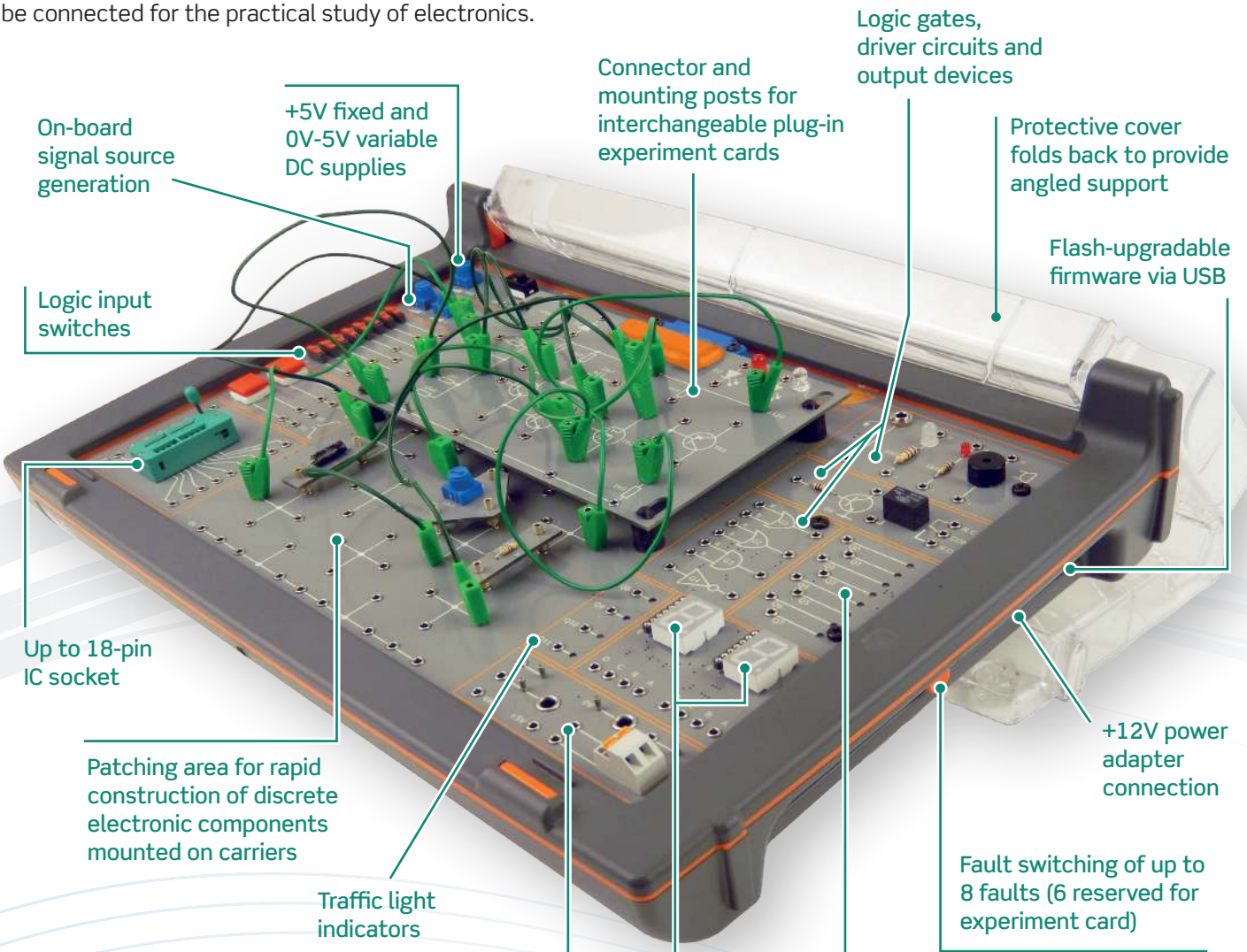
Electronics Study Trainer (320-00)

The Electronics Study Trainer provides the basis for a practical resource that introduces students to core electronics and electronic systems through a wide range of practical activities.

The study trainer allows a range of experiment cards to be connected for the practical study of electronics.

Order as:

- 320-00 Electronics Study Trainer



Complete Electronics Workstation (320-10)

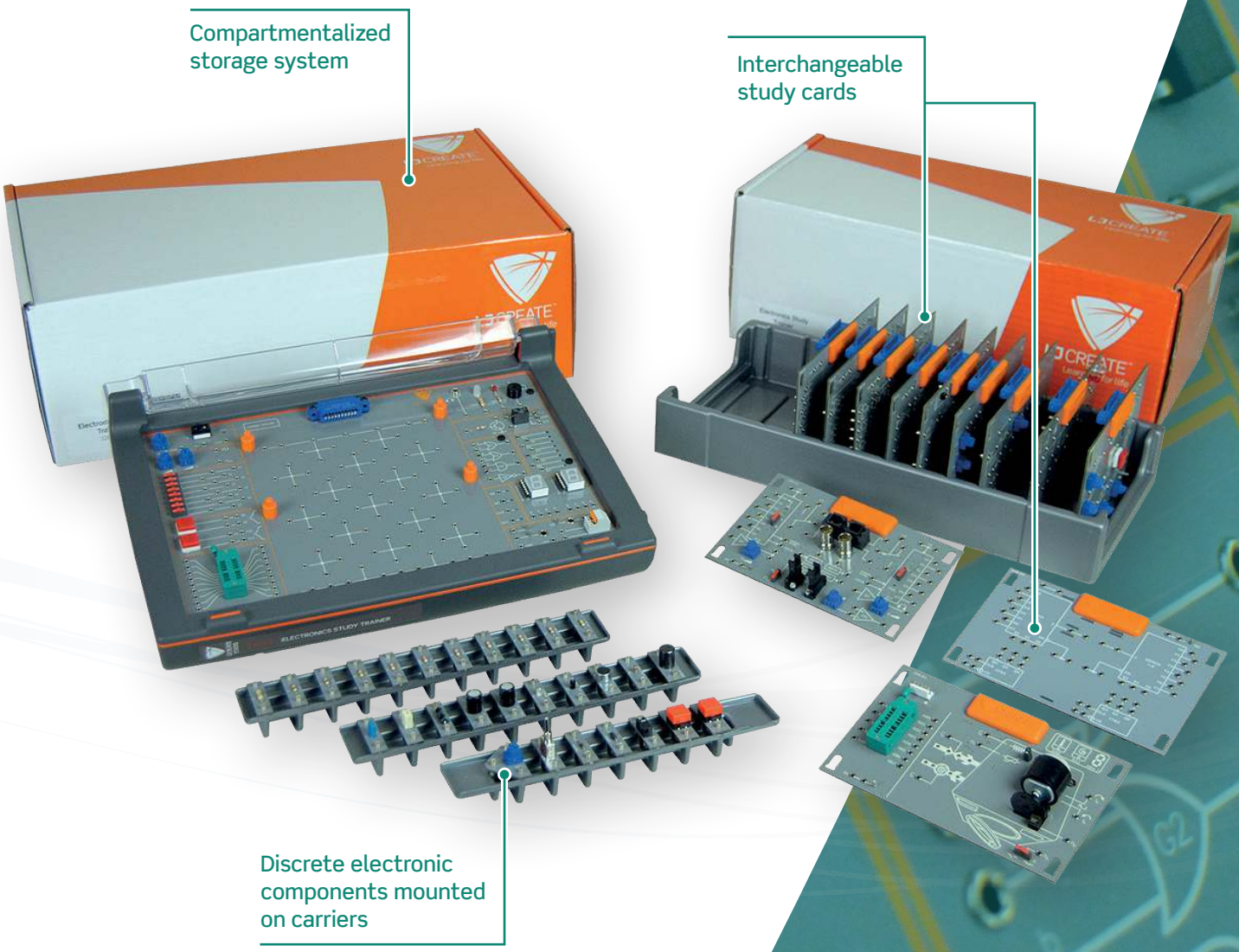
The core electronics series allows the practical study of a wide range of electronics subjects, including DC and AC circuits, semiconductors, analog and digital systems, telecommunications and microcontrollers.

The series comprises an electronics study trainer and component set, and a range of plug-in experiment cards. The unique design of the trainer includes a heavy duty casing with transparent protective cover.

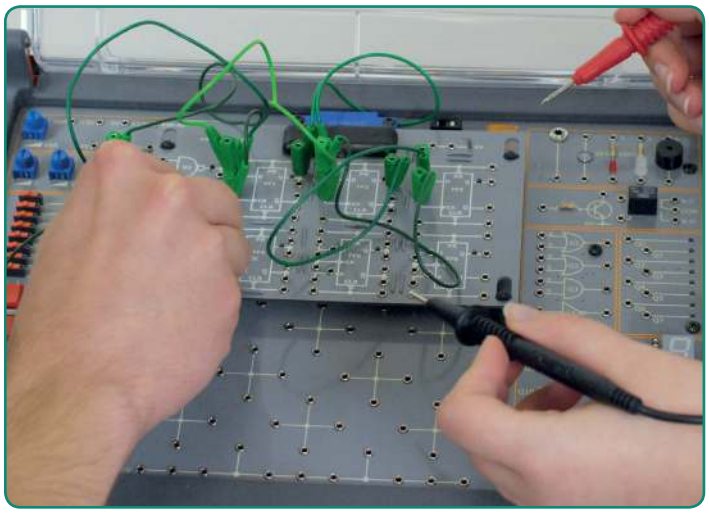
When in use, the cover folds back to provide an angled support for the unit. With the cover closed, trainers become stackable for easy storage.

Order as:

- 320-10 Complete Electronics Workstation (includes 320-00 to 320-61)



Electronics
Hardware

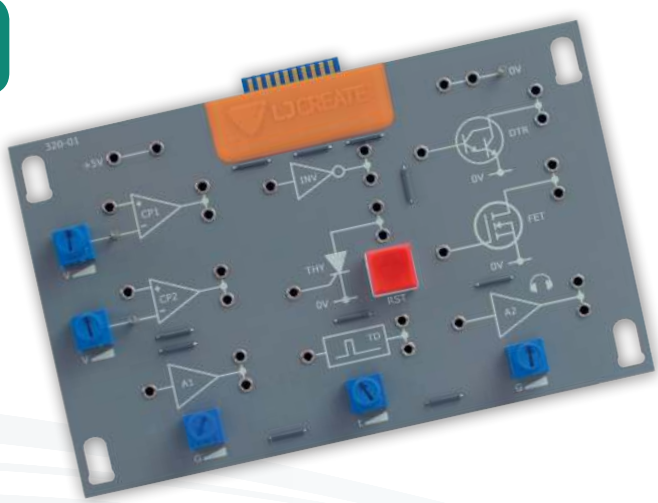


Our completely re-designed core electronics series is a perfect blend of component-based and systems training for intermediate (Level 1, 2 and 3) electronics students.

- Patch discrete components quickly and easily
- Add an interchangeable study card for more complex circuits
- Or combine the two for even more flexibility!
- Controlled troubleshooting faults that really test circuit understanding

Please note: these circuit cards are used in conjunction with 320-00 Electronics Study Trainer

Electronic Systems Card (320-01)

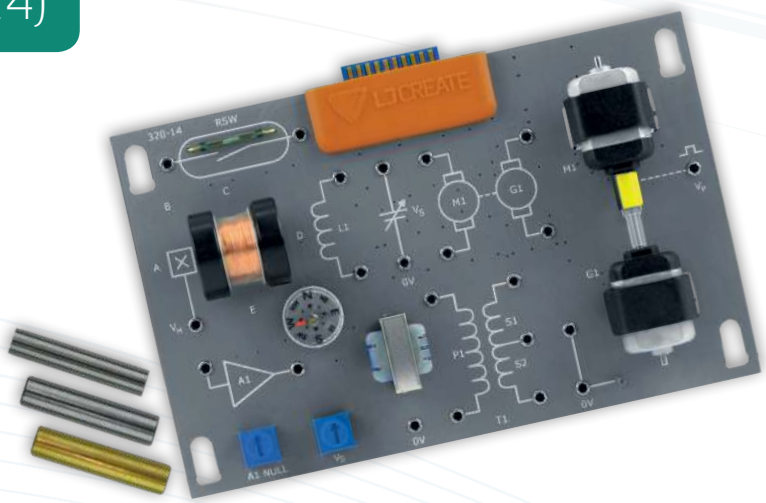


The Electronic Systems Card introduces students to the principles of electronic systems through the interconnection of a variety of input, process and output subsystems.

Typical practical tasks and topics include:

- Darlington pair and FET investigation
- Thyristor investigation
- Automatic lighting project
- Baby alarm project
- Intruder alarm system project
- Testing and fault-finding

Electromagnetism Card (320-14)

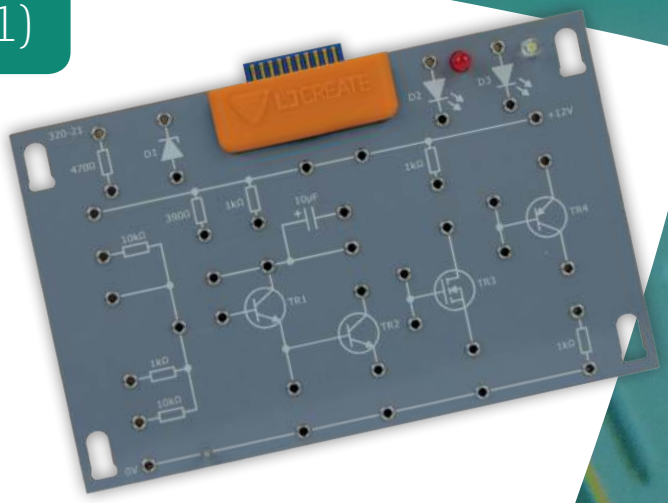


The Electromagnetism Card introduces students to the principles and applications of electromagnetism.

Typical practical tasks and topics include:

- Reed switch operation
- Hall effect investigation
- Field strength of an electromagnet
- Field shape and direction for an electromagnet
- Electromagnetic induction and solenoid operation
- Transformer power and efficiency
- DC motor-generator investigation
- Fault-finding electromagnetic devices

Diodes and Transistors Card (320-21)

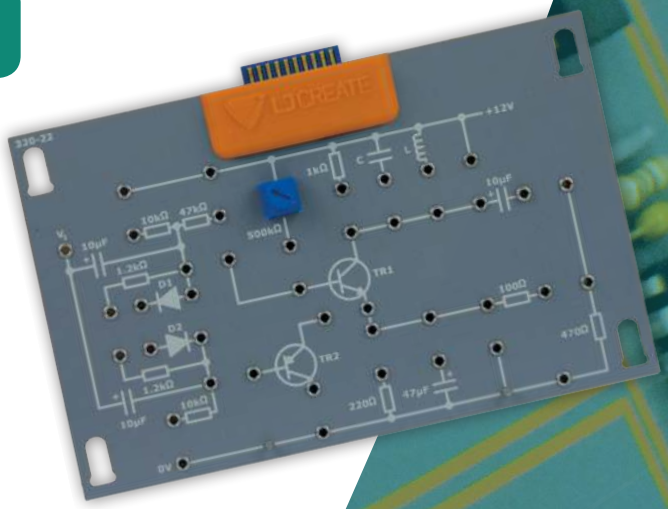


The Diodes and Transistors Card allows students to investigate semiconductor diodes and transistors through a range of practical activities.

Typical practical tasks and topics include:

- Voltage stabilization using a zener diode
- NPN transistor as a voltage amplifier
- FET operation
- Testing and fault-finding diode and transistor circuits

Transistor Amplifiers Card (320-22)

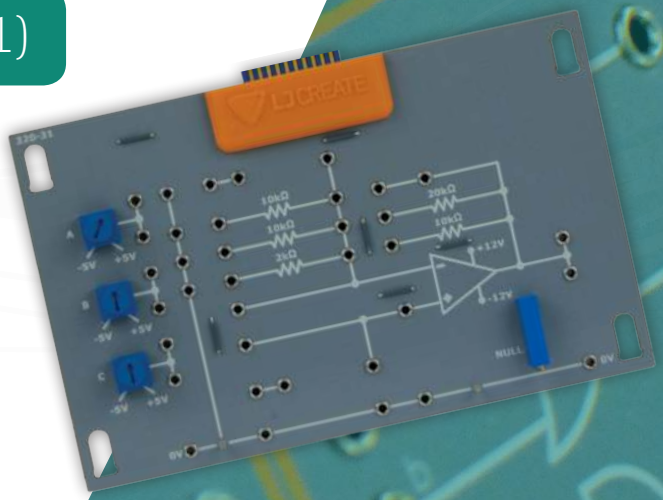


The Transistor Amplifiers Card allows students to investigate transistor amplifier circuits through a range of practical activities.

Typical practical tasks and topics include:

- Build and test Class A, B, AB and C transistor amplifiers
- Investigate crossover distortion
- Effects of feedback in a transistor amplifier circuit
- Fault-finding transistor amplifier circuits

Operational Amplifiers Card (320-31)

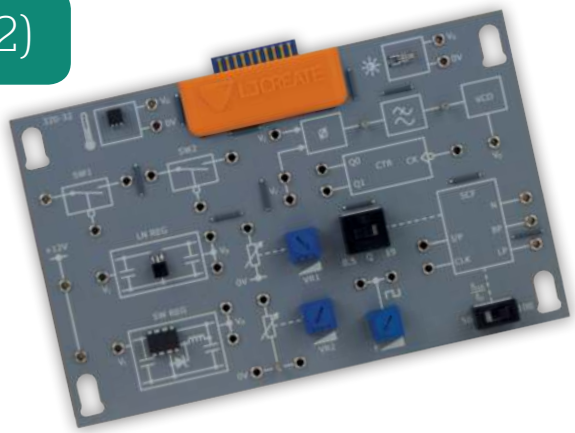


The Operational Amplifiers Card allows students to investigate operational amplifier circuits through a range of practical activities.

Typical practical tasks and topics include:

- Investigating a voltage comparator circuits
- Building and testing inverting & non-inverting amplifiers
- High frequency performance of an operational amplifier
- Fault-finding operational amplifier circuits

Analog Integrated Circuits Card (320-32)

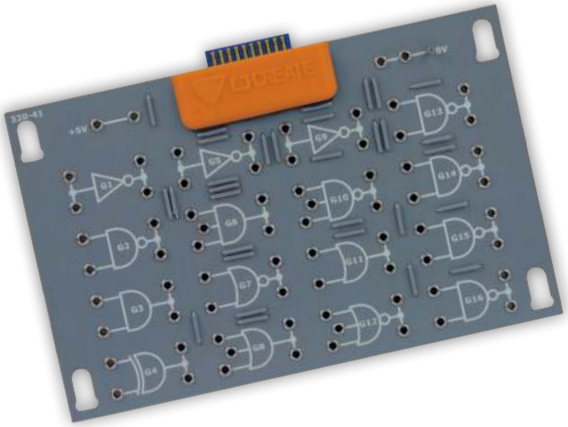


This card allows students to investigate a variety of analog integrated circuits through a range of practical activities.

Typical practical tasks and topics include:

- Comparing linear and switch mode voltage regulators
- Testing a switched capacitor filter
- Investigating the operation of a phase locked loop
- Fault-finding analog integrated circuits

Combinational Logic Card (320-41)

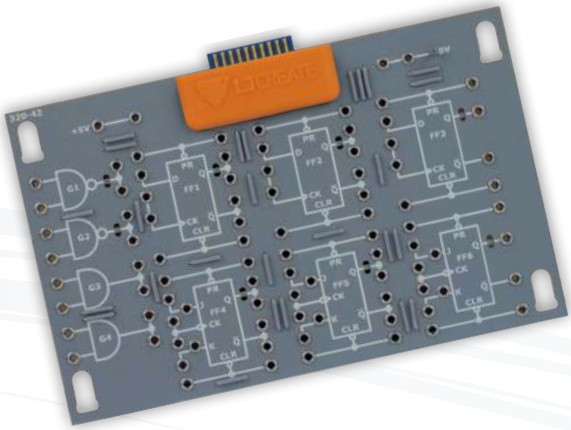


The Combinational Logic Card introduces students to combinational logic through a range of practical activities.

Typical practical tasks and topics include:

- Investigating logic gates
- Constructing truth tables
- Building EXOR gates from other gates
- Testing and fault-finding combinational logic systems

Sequential Logic Card (320-42)

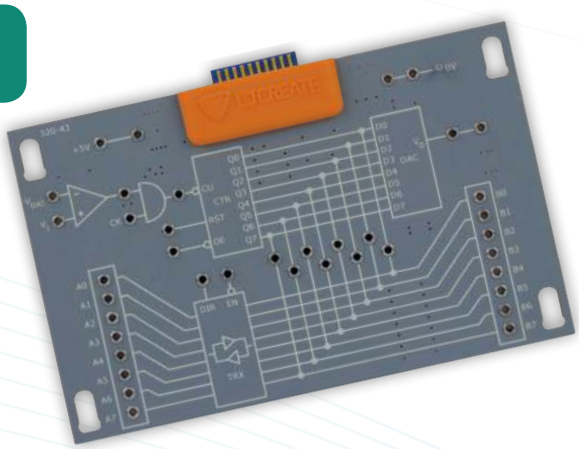


The Sequential Logic Card introduces students to sequential logic through a range of practical activities.

Typical practical tasks and topics include:

- D-type and J-K flip-flop
- Binary counter operation
- Frequency division
- Testing and fault-finding sequential logic systems

A/D-D/A Digital Systems Card (320-43)

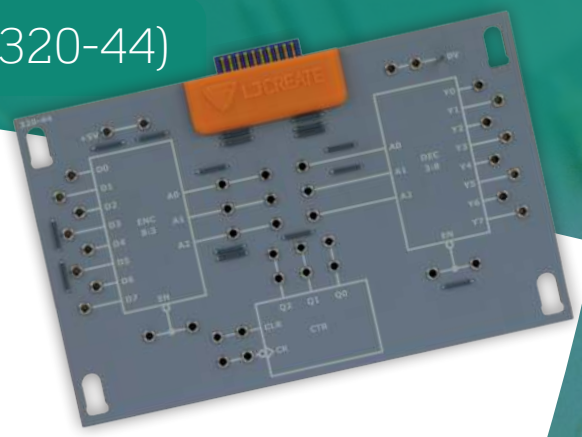


This card introduces students to digital-to-analog conversion, analog-to-digital conversion and bus control through a range of activities.

Typical practical tasks and topics include:

- Investigating a D/A converter
- Building and testing an A/D converter
- Testing and fault-finding A/D and D/A systems

Encoder/Decoder Digital Systems Card (320-44)

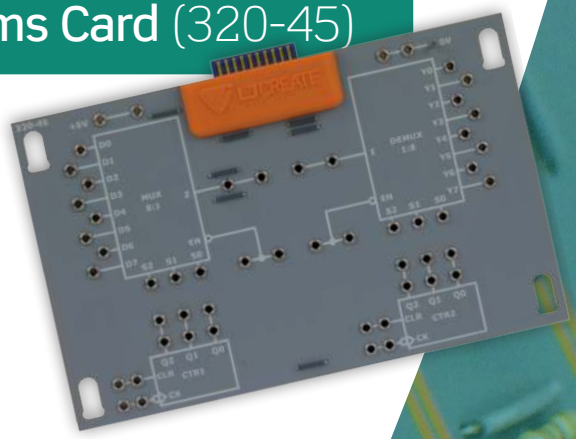


The Encoder/Decoder Digital Systems Card introduces students to digital encoders and decoders through a range of practical activities.

Typical practical tasks and topics include:

- Investigate digital encoders
- Decoding the output from a binary counter
- Building and testing an encoder-decoder system
- Fault-finding an encoder-decoder system

Multiplexer/Demultiplexer Digital Systems Card (320-45)

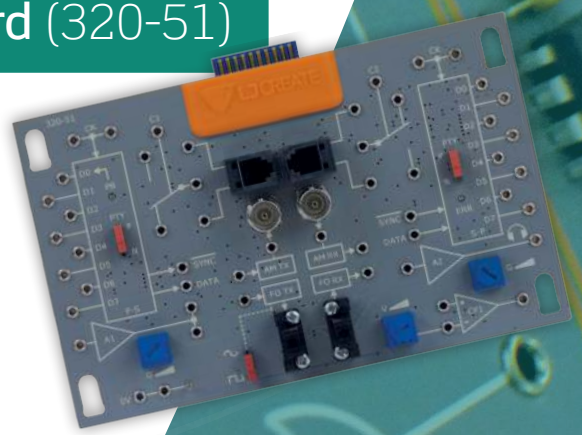


This card introduces students to digital multiplexers and demultiplexers through a range of practical activities.

Typical practical tasks and topics include:

- Scanning multiplexer inputs using a binary counter
- Building and testing multiplexers/demultiplexers
- Clocking & Synchronization
- Fault-finding multiplexer/demultiplexer systems

Electronic Communications Systems Card (320-51)

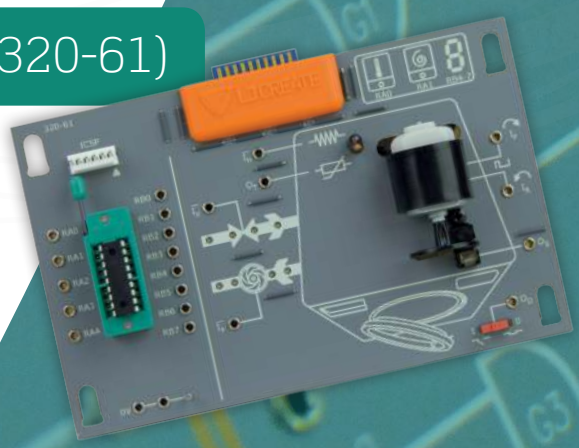


This card introduces students to the principles of electronic communication systems through a range of practical activities.

Typical practical tasks and topics include:

- AM & Optical transmission
- Digital data transmission
- Simplex and duplex modes
- Fault-finding electronic systems

PIC Programmer and Applications Card (320-61)



This card introduces students to programming microcontrollers through a range of activities based around a washing machine simulation.

Typical practical tasks and topics include:

- Sensors and actuators
- Controlling I/O port lines
- Using sub-routines

Online Lessons

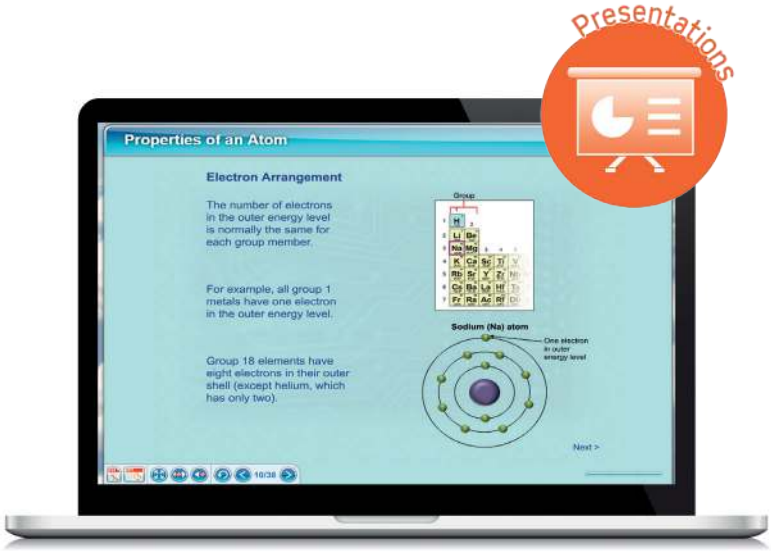
Courses from our library of high school lessons

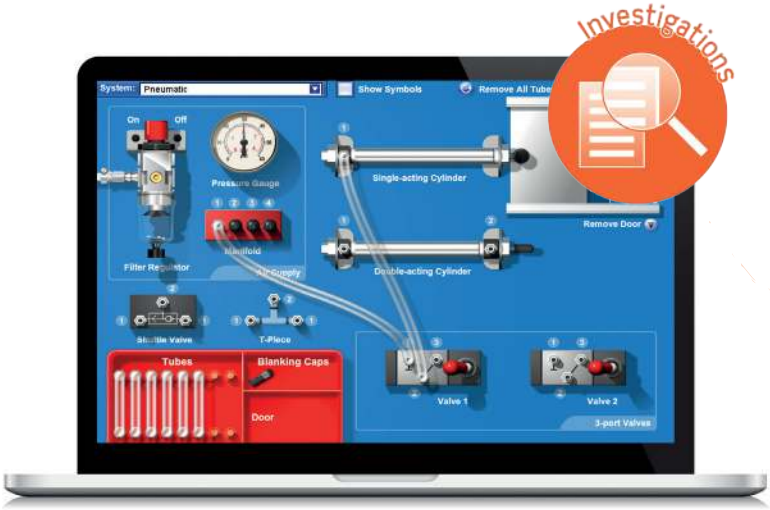
Our online library is a comprehensive resource of lessons for college students. An extensive range of presentations, investigations and assessments can be accessed through an online portal; no specialist software or downloads are needed.

Using our LMS, teachers can quickly select and assign lessons to student groups where student progress can be tracked and reported. Ready-made courses for the more popular qualifications are also available.

OUR 'HIGH SCHOOL PACK' LESSONS ARE AVAILABLE IN THE FOLLOWING COURSE GROUPS:

- Scientific Investigation and Reasoning
- Earth and Space Sciences
- Physical Science
- Life Science
- Scientific Processes
- Earth Systems
- Matter
- Forces and Motion
- Energy
- Electricity and Magnetism
- Waves
- Nuclear Physics
- Chemical Structure and Bonding
- Chemical Reactions

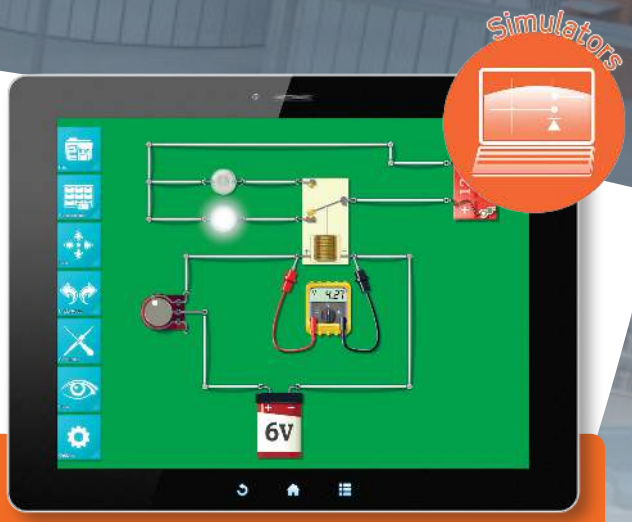




- Anatomy
- Evolution and Genetics
- Biochemistry and Cell Biology
- The Living World
- Engineering Design
- Green Technologies
- Mechanical Systems
- Electronics
- Fluid Power
- Construction
- Telecommunications
- Manufacturing
- Transportation
- Agriculture
- Biomedical Technology
- Robotics
- English Language
- Mathematics
- Information Technology
- Employability Skills

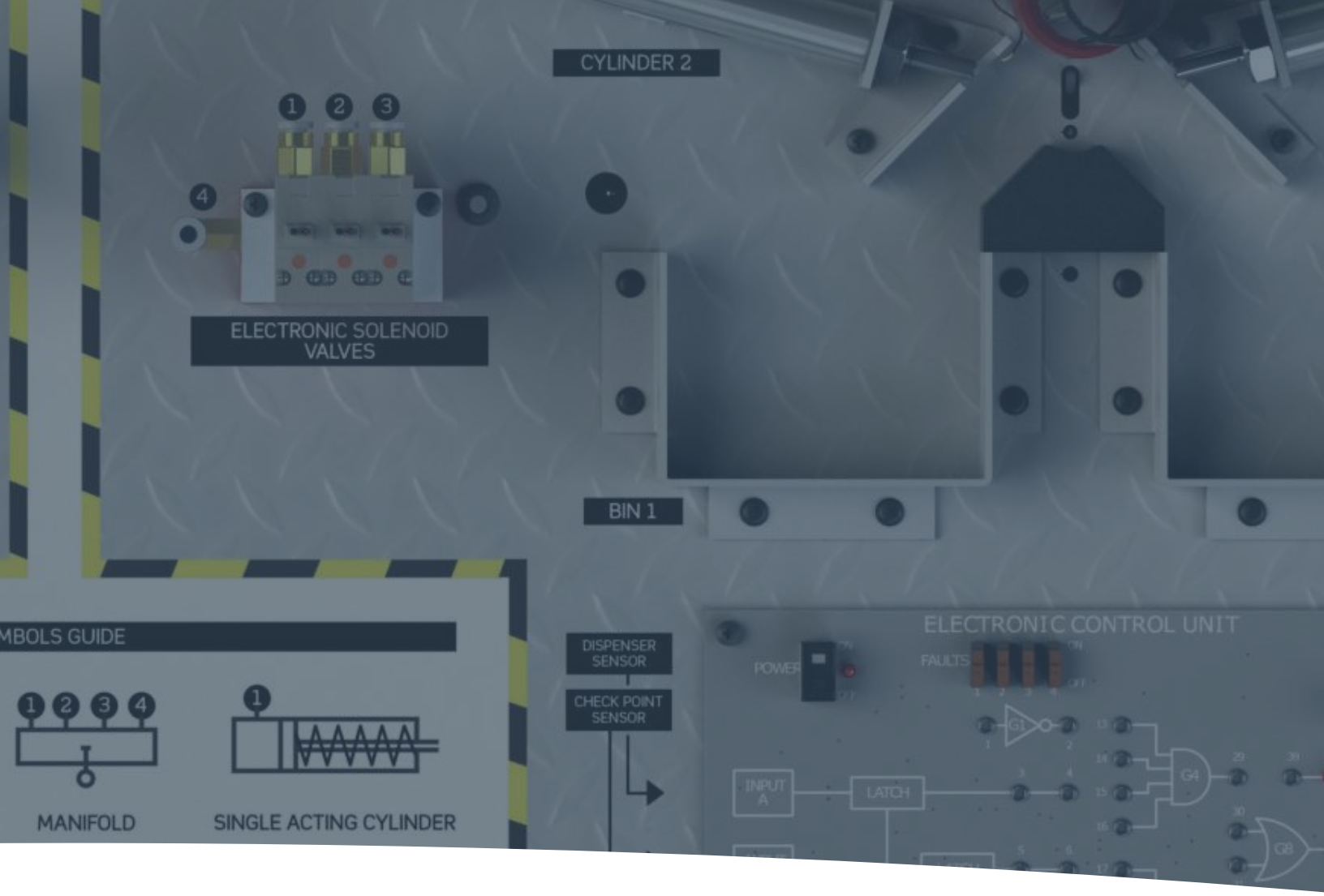
Digital Content

Our digital content is written by our team of experts and comprises presentations, investigations, practical tasks, assessments and support materials such as applications and simulators. Students can improve their knowledge then test out their skills with a practical task or design project.



Simulators

As well as lessons, our library includes several unique simulators such as the Virtual Electrical Circuits Trainer.



For more information on our range of learning resources, please contact:

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