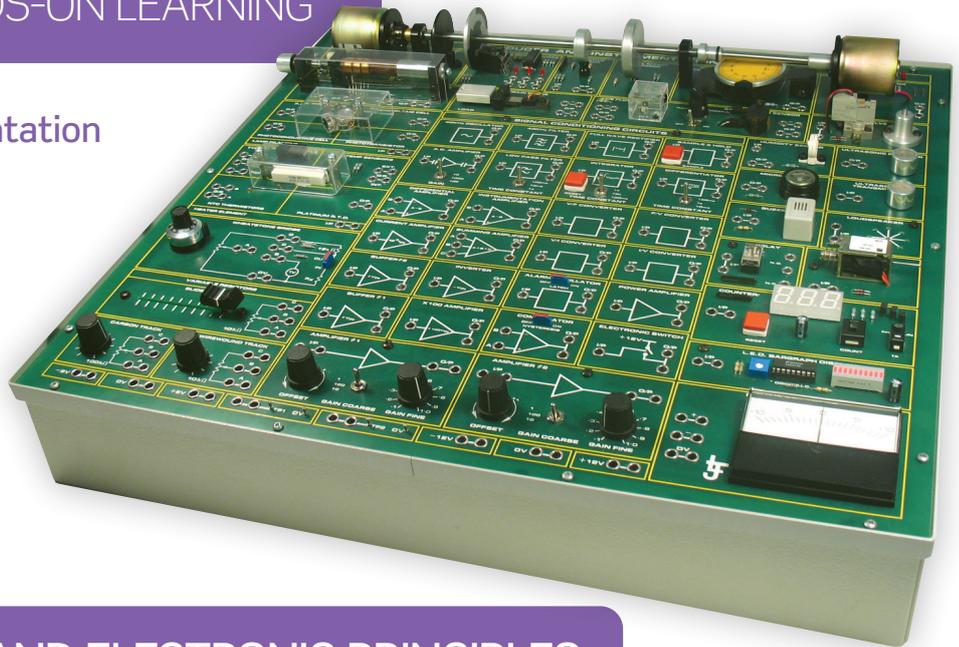




## CORE 10: ENGINEERING AND MANUFACTURING CONTROL SYSTEMS EQUIPMENT FOR HANDS-ON LEARNING

### Transducers and Instrumentation (24 Practical Activities)

- Types of sensors
- Purpose and function of sensors
- Types of actuators
- Measurement applications
- Electrical and pneumatic power sources
- Open and closed loop systems
- Overdamping and underdamped systems
- Three term control



## CORE 8: ELECTRICAL AND ELECTRONIC PRINCIPLES EQUIPMENT FOR HANDS-ON LEARNING

### Core Electronics Workstation (148 Practical Activities)

- Introduction to basic circuits
- DC circuits
- AC circuits and phasors
- Analogue and digital signal conditioning
- Semiconductor devices
- Electromagnetic systems



## CORE 1: WORKING WITHIN THE ENGINEERING AND MANUFACTURING SECTORS EQUIPMENT FOR HANDS-ON LEARNING

### Injection Moulding Trainer

- Injection mould the parts for a model car
- Mould different doorknob designs and test each one for strength
- Investigate why a mould must be securely clamped
- Mould a plastic handled screwdriver with a metal blade
- Adapt an existing mould design to make a corn cob holder
- Explore the benefits of adding a draft angle to a mould
- Investigate the effects of component undercuts and overhangs on mould tool design



## CORE 9: MECHATRONICS EQUIPMENT FOR HANDS-ON LEARNING

### Programmable Logic Controls (23 Practical Activities)

- Operation, use and application of programmable logic controllers

### Electro-Pneumatic Trainer (8 Practical Activities)

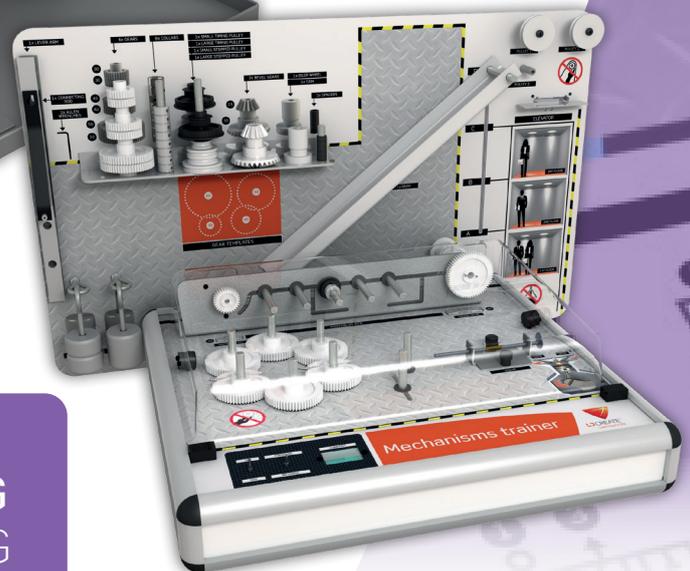
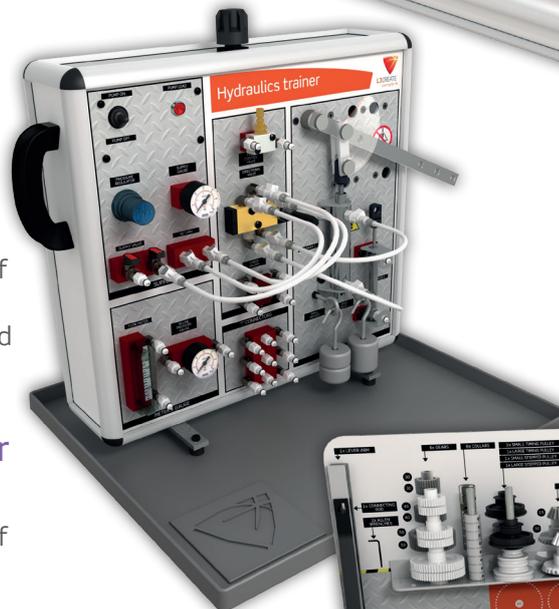
- Basic principles and applications of pneumatics in relevant contexts
- Operation of electronic devices and circuits in mechatronics contexts

### Hydraulics Systems Trainer (7 Practical Activities)

- Basic Principles and applications of hydraulics in relevant contexts

### Mechanisms Trainer (5 Practical Activities)

- Basic Principles and applications of mechanisms in relevant contexts



## CORE 5: ESSENTIAL SCIENCE FOR ENGINEERING AND MANUFACTURING EQUIPMENT FOR HANDS-ON LEARNING



### Measurement Kit (5 Practical Activities)

- Techniques for making accurate measurements along with use of a range of instruments
- Density



### Motion Kit (4 Practical Activities)

- Speed, velocity, acceleration
- Forces acting at a point
- Linear momentum and impulse



### Chemistry Apparatus Kit (39 Practical Activities)

- The structure of mixtures, solutions, and suspensions
- Density and metals
- Chemical reactions



### Physics Apparatus Kit (18 Practical Activities)

- Friction
- Conservation of energy
- Linear momentum and impulse



### Force and Energy Kit (3 Practical Activities)

- Force, displacement and cause in work
- Calculating the amount of work



### Data Logging Kit (22 Practical Activities)

- Measurement
- Forces and Motion
- Thermodynamics

# T Levels: Engineering and Manufacturing

## Online Lessons Pack: Topics for Engineering Core Content

### Course 1: Working within the Engineering and Manufacturing Sectors

- Engineering and manufacturing design
- Maintenance, installation and repair practices
- Manufacturing, processing and control practices

### Course 2: Engineering and Manufacturing Past, Present and Future

- Innovation and emerging trends
- Impact of technological advances

### Course 3: Engineering Representations

- Graphical information
- Drawing, dimensions and sizing

### Course 4: Essential Mathematics for Engineering and Manufacturing

- Basic arithmetic
- Algebra
- Geometry
- Area and volume
- Graphs and charts
- Trigonometry
- Vectors and moments

### Course 5: Essential Science for Engineering and Manufacturing

- Scientific method
- Measurement
- Chemical composition and behaviours
- Physical forces and behaviours
- Thermal dynamics
- Fluid dynamics

### Course 6: Materials and their Properties

- Material structures
- Metals
- Plastics
- Polymers
- Material properties
- Disposal of materials
- Material processing
- Heat treatments
- Material testing

### Course 7: Mechanical Principles

- Motion and mechanics
- Newton's laws
- Beams
- Storage and transfer of force and energy
- Gravity
- Friction
- Power sources

### Course 8: Electrical and Electronic Principles

- Atomic theory
- Voltage, current and resistance
- Ohm's law
- Analogue and digital signals
- Signal processing
- DC circuit networks
- AC circuits
- Phasors
- Semiconductor devices
- High power devices
- Magnetism and electromagnetism

### Course 9: Mechatronics

- Electronic control of mechanical devices
- Programmable logic controllers
- Hydraulics
- Pneumatics

### Course 10: Engineering and Manufacturing Control Systems

- Open and closed loop systems
- Feedback
- Summing points
- PID control
- Transfer functions
- Relationship between input and output
- Overdamping and underdamping
- Pulse width and amplitude modulation
- Industrial network systems
- Types of sensors and measurement applications
- Actuators and power sources

### Course 11: Quality Management

- BS and ISO standards
- Effects of standards on quality and safety

### Course 12: Health and Safety Principles and Coverage

- Health and safety practices
- Health and safety in laboratories
- Health and safety in the workplace
- Fire Safety
- Chemical hazards
- Manual handling
- Risk and hazard identification
- Control measures

### Course 13: Business, Commercial and Financial Awareness

- Commercial priorities
- Markets and customers
- Management practices
- Business models
- Profits and cash flow
- Balance sheets and P/L statements
- Budgets and recording financial transactions

### Course 14: Professional Responsibilities, Attitudes, and Behaviours

- Organisational structure
- Relationship to others
- Equality and inclusion
- Performance and error reduction
- Reputation and ethics

### Course 15: Stock and Asset Management

- Stock and inventory control
- Product life cycles
- Supply chain issues
- Warehousing
- Asset management

### Course 16: Continuous Improvement

- Principles of continuous improvement
- Planning, monitoring and implementing
- Lean principles and practices

### Course 17: Project and Programme Management

- Project planning, control and practices
- Collaborative project working practices

