



**LJ CREATE™**  
Learning for life



Innovation in  
electronics education

## Digiac

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Introducing our range of electronics teaching resources

- Hands-on practical tasks
- Computer-based lessons
- Teacher presentations
- Continuous assessment
- Tools for school/college collaboration

# Digiac - innovation in electronics education

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## Our mission

Here at LJ Create we believe that learners need to be fully engaged in the learning process to achieve their best. Being inspired by their teachers, their surroundings and their learning materials is key.

That's why we develop practical and innovative topic specific solutions that enable learners to achieve a firm foundation for their future, allowing them to grow, develop skills and evolve in a way that meets their individual learning needs.

To achieve this we work in partnership with schools, colleges and local authorities in the UK to develop the teaching of technology-based science and engineering within the secondary curriculum and for 14-19 applied learning programmes, including the new diplomas.



## Our solution

We provide a comprehensive range of ICT-based teaching and learning resources that can be used to deliver practical programmes of study in electronics technology.

Our solutions have been specifically designed to enable the user to create a programme that meets their specific curriculum requirements post-14. Resources include:

- Teacher presentations with assessment
- Personalised learning
- Practical hands-on work
- Troubleshooting
- Projects
- Web-deliverable materials
- Tools for collaboration between schools and colleges
- Managed learning environment with continuous reporting/assessment
- Functional skills to support electronics instruction



## AEP - Accelerated electronics programme

This electronics training programme uses multimedia curriculum to deliver the content in a shorter time span than a traditional in-depth electronics programme.

AEP can be used to deliver the underpinning electronics knowledge for other technical areas such as IT systems maintenance, automotive maintenance or mechatronics. It can be used for programmes at Levels 1, 2 and 3.

### Accelerated electronics - the benefits

- Easily managed hardware and teaching materials make it easy to run customized electronics courses
- Computer aided instruction and supporting instructor presentations allow the programme to be used by a wide range of students
- Theory support material provides the instructor with background information on each topic area
- Provides the 'core' electronics skills for a wide range of vocational and hardware programmes
- Theory PowerPoint® presentations
- Students learn valuable hands-on skills that are directly transferable to the world of work
- Computer managed learning optimizes the teacher's time and makes class sessions more productive.
- Generation of customized reports that correlate to local, national and other standards
- Student centred learning materials help develop self-study and lifelong learning skills



## D3000 - Comprehensive electronics programme

D3000 can provide a comprehensive electronics instruction programme that spans Levels 1-4. It has expansion capabilities that include specialist electronics areas such as microcontrollers, avionics or autotronics.

Students are able to use virtual or real instrumentation, and learning materials are available via a LAN-based management system or VLE. Extensive use is made of computer-configured fault insertion for troubleshooting and diagnostics.

### Comprehensive electronics - the benefits

- Hands-on practical activities
- Computer aided multimedia courseware
- A comprehensive range of study modules that address the major topics in electronics
- Computer managed learning via a local area network, an Intranet or the Internet
- On-line SCORM conformant learning for flexible delivery on and off-site
- Multimedia support resources
- Theory PowerPoint® presentations
- Automatic fault insertion teaches fault finding skills
- Pre-built electronic circuits provide reliable, easy to manage experiments
- Breadboard circuit assembly for hands-on skills with real components
- Virtual instrumentation reduces the need for traditional test equipment

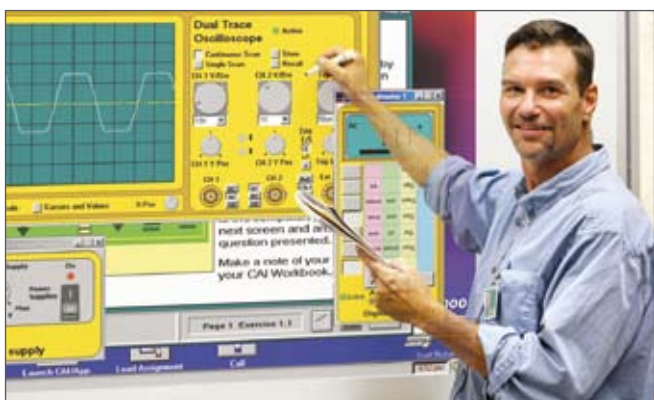
# Typical delivery methods



## Theory presentation

Available for use with each programme are PowerPoint® presentation materials for the teacher. These presentations, which can be linked to a student response

system, provide background theory and knowledge. Student performance data can be collected through the management system.



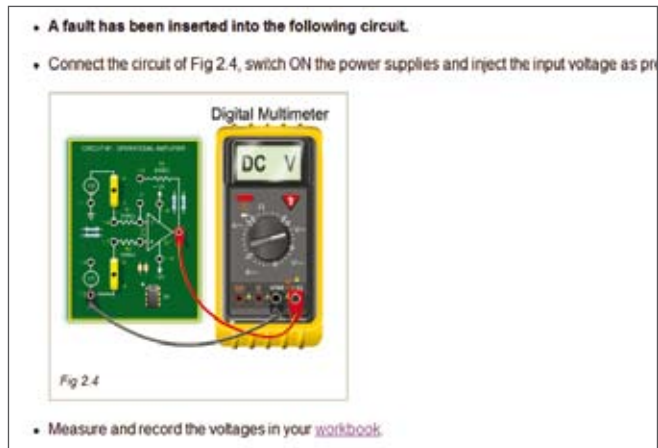
## Demonstration

Using the virtual test instruments, typical waveforms and digital multimeter readings can be presented to the whole class. This allows the experimental procedure to be demonstrated with typical results.



## Hands-on practical

Working in small groups or individually, students investigate practical electronic circuits using real or virtual test equipment.

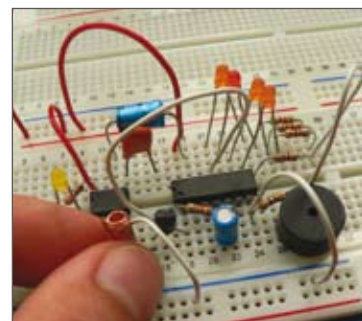


## Troubleshooting/diagnostics

Many of the assignments have the ability to introduce faults into their circuits. These faults are introduced under the control of the D3000 base unit.

## Project activities

Both the AEP and D3000 programmes include student project activities using breadboard and patchboard systems. These projects can be extended to include soldering and circuit test skills.



## e-Learning and assessment

Throughout the blend of learning activities, student performance and knowledge retention are continually assessed. Student responses to multiple choice questions are marked automatically by the management system.

To configure your electronics programme to meet your exact needs, you simply follow a three-step process:

## Step 1: Select the base unit you want to use

### D3000 Virtual Instrument Platform

This unit integrates built-in virtual test instruments in the form of two multimeters, an oscilloscope and a signal generator. Also features all facilities that are provided by the D3000 Experiment Platform.



### D3000 Experiment Platform

Provides power supplies and circuit connection facilities for the complete range of D3000 circuit boards. Automatic and manual switching of faults into most boards is also provided.



## Step 2: Select the appropriate study modules (details on pages 6-11)



AEP accelerated electronics programme



D3000 comprehensive electronics programme

## Step 3: Add the management system to accommodate the number of stations

### Computer managed learning

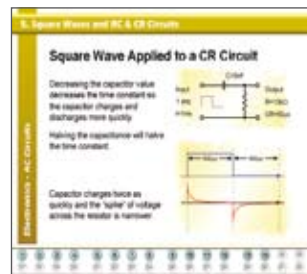


You have a choice of management systems for your programme. If you only want Local Area Network access then select our ClassAct system. If you want Internet-based access then you need to select

our Virtual Learning Environment (VLE) option. All systems can be installed as stand-alone workstations if required.

The on-line content conforms with the SCORM standards for VLE delivery.

### Support resources



For the instructor, our electronics programme also provides a range of learning support materials. These include video tutorials on the use of test equipment and over 100 high quality PowerPoint® theory presentations.

The theory presentations can be used with the optional ClassAct SRS wireless student response system, which provides interactive assessment for whole class teaching. Data from this system can be added to the ClassAct database.

# AEP - Accelerated electronics programme

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The AEP accelerated electronics programme uses dynamic, multimedia learning materials to deliver an electronics programme in a much shorter time than traditional programmes.

A comprehensive series of instructor support resources allow AEP programmes to be delivered by non-specialists. This makes AEP ideal for delivering the electronics content of programmes such as:

- Automotive technology
- Computer maintenance
- Industrial maintenance
- Communications

## Electronics fundamentals

### AEP11 DC Circuits

This module introduces students to the basic concepts involved in DC circuits. Typical topic areas include: Electrical safety, the basic DC circuit, resistance and Ohm's law, electrical power and resistor colour coding, and Kirchhoff's laws.

### AEP12 AC Circuits

Students are introduced to the principles related to AC circuits. Typical topic areas include: AC measurements, capacitor construction, capacitor action, capacitors on AC supplies, square waves and RC & CR circuits, and inductors on AC supplies.

### AEP14 Electromagnetism

This module allows students to investigate the principles and applications of electromagnetism. Typical topic areas include: Magnetism and electromagnetism, the solenoid and electromagnetic induction, transformers, and relays.

## Semiconductors

### AEP21 Diodes and Transistors

Students are introduced to diodes, transistors and other semiconductor devices through a range of hands-on activities. Typical topic areas include: Semiconductor theory, diode characteristics and applications, light emitting diodes, transistor characteristics, and input sensors for transistor switching.

### AEP22 Further Semiconductor Devices

This module extends the student's knowledge of semiconductors by introducing a range of new devices and circuits. Typical topic areas include: The emitter follower, PNP common emitter amplifier, introduction to MOSFETs, MOSFET applications, heatsinks, silicon controlled rectifiers, and AC applied to an SCR.



## Linear circuits

### AEP31 Amplifier Circuits

Students are introduced to operational amplifiers and their applications through a range of hands-on activities. Typical topic areas include: Introduction to operational amplifiers, inverting voltage amplifiers, buffer amplifiers, summing amplifiers, voltage comparators, difference amplifiers, and active filter circuits.



## Digital electronics

### AEP41 Digital Electronics

This module introduces students to the theory of the basic components used in digital circuits. Typical topic areas include: Switch logic, logic functions, combinational logic, Boolean algebra & De Morgan's theorem, and using combinational logic.

### AEP42 Further Digital Circuits

Students further investigate digital electronics through a series of assignments based around integrated circuits. Typical topic areas include: The 555 monostable, the NAND gate astable, binary counters, 7-segment displays and decoders, multiplexers and demultiplexers, and digital to analog and analog to digital converters.

## Circuit construction

### AEP51 Breadboard Component Projects

Students build simple circuits on a solderless breadboard to investigate the operation of a range of electronic components. Typical topic areas include: Breadboarding techniques, resistor circuit, potentiometer circuit, and photocell circuit.

### AEP52 Breadboard Circuit Projects

This module allows students to build more complex circuits using solderless breadboard techniques. Typical topic areas include: Oscillator circuit, flashing light circuit, intruder alarm circuit, automatic light switch circuit, and continuity tester circuit.

## Control systems

### AEP61 Electronic Control Systems

In this module, students are introduced to electronic control systems, their operation and application. Typical topic areas include: Microprocessor control systems, single chip microprocessor systems, the PIC 16F84 microcontroller, flowcharts, and output devices.

### AEP62 Further Control Systems

Students write BASIC programs to perform a wide range of control applications using a PIC microcontroller. Typical topic areas include: Guidance on programming tasks, introduction to applications module, and further BASIC commands.

## Telecommunications

### AEP71 Telecommunications

This module introduces students to the basic principles and applications of a variety of telecommunications systems. Typical topic areas include: Resonance and tuned circuits, telecommunications principles, amplitude modulation, and frequency modulation.

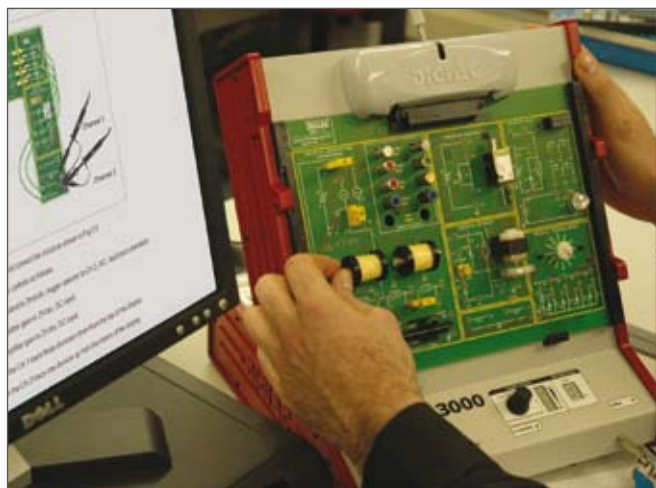
### AEP72 Further Telecommunications

This module allows students to investigate a range of more advanced telecommunications techniques and their practical applications. Typical topic areas include: Pulse modulation, pulse code modulation, parallel/series transmission, and mobile communication.



# D3000 - Comprehensive electronics programme

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The D3000 electronics programme provides a comprehensive, computer-based training resource, that delivers practical hands-on instruction across a wide range of electronics technology topics.

The flexible design of D3000 allows it to be used with a wide range of students across a variety of electronics courses. Each of the circuit study modules is supplied complete with competency-based curriculum material that delivers both underpinning theory and related practical activities.

The majority of the circuit study modules are supported by SCORM conformant learning materials.

## Fundamentals of electricity/electronics

### D3000 0.1 Basic Electricity

- Symbols and switches
- Magnetism and relays
- Measuring electricity
- Lamps in series and parallel
- Resistance

### D3000 1.1 DC Circuits

- The basic DC circuit
- Ohm's law
- Resistor colour coding
- Resistors connected in series/parallel

### D3000 1.2 AC Circuits

- Sinusoidal waveforms
- AC supply with resistive load
- C and L on square and sinusoidal supplies
- RC, RL, and RLC circuits on AC supplies

### D3000 1.3 Electrical Networks

- Supply source internal resistance
- Maximum power transfer from source to load
- Dual voltage DC and combined AC/DC supplies
- Superposition and star-delta transformation

### D3000 1.4 Electromagnetic Devices

- Permanent magnets and magnetic fields
  - Electromagnets
  - Inductive reactance
  - The transformer, solenoid, and relay
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## Semiconductor electronics

### D3000 2.1 Semiconductors-1

- P-N junction diode
- Half wave rectifier
- Zener diode
- Transistor characteristics and amplifier

### D3000 2.2 Semiconductors-2

- Darlington pair emitter follower
- Complementary PNP/NPN pair
- Constant current sink
- Differential amplifier
- JFET characteristics and amplifier

### D3000 2.3 Power Electronic Devices-1

- Power transistor
  - Audio power amplifier
  - MOS power FET
  - Silicon controlled rectifier
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## Linear electronics

### D3000 3.1 Operational Amplifiers

- Inverting amplifier
- Integrator
- Non-inverting amplifier
- Summing amplifier



## Digital Logic

### D3000 4.1 Fundamentals of Digital Logic

- Number systems
- Transistor-transistor logic (TTL)
- Logic expression and simplification
- TTL and CMOS gates
- Open collector gates

### D3000 4.2 Combinational Logic Systems

- EX-OR and EX-NOR gates
- Encoder and decoder circuits
- Multiplexer and demultiplexer circuits
- Magnitude comparator circuits
- Full adder circuits

### D3000 4.3 Sequential Logic

- The S-R latch
- The D-type flip-flop
- The J-K flip-flop
- Shift registers
- Binary counters

### D3000 4.4 Digital Systems

- The analog switch and multivibrator IC circuits
- Binary/BCD counters and 7-segment decoder/driver/displays
- The analog comparator and analog integrator
- D-A converter IC and A-D converter circuit
- Voltmeter, and frequency counter/timer

## Specialist electronics

### D3000 1.7 AC Power

- The three-phase supply
- 6-wire, 3-wire and 4-wire connections, Delta/Delta
- Delta/Wye connection
- Wye/Wye connection
- Wye/Delta connection

### D3000 2.4 Optoelectronics

- State indicators
- Display devices
- Photoconductive cells
- Optic fiber devices
- Infra-red link

### D3000 2.5 Advanced Transistor Amplifiers

- Transistor amplifier AC behaviour and feedback
- Single-stage amplifiers
- Direct-coupled multistage amplifiers
- AC coupled multistage amplifiers
- Tuned load amplifiers

### D3000 2.6 Power Electronic Devices-2

- Single and bi-phase control
- SCR bridge circuits
- Jones commutator
- McMurray-Bedford inverter

### D3000 3.2 Filter Circuits

- Simple RC filters
- LC bandpass filters
- The low pass Pi filter
- Active filters

### D3000 3.3 Oscillators

- Wien bridge oscillator
- Tuned drain FET oscillator
- Astable and monostable multivibrators
- 555 timer

### D3000 3.4 Power Supplies

- Rectification
- Stabilization and smoothing
- Protection
- Fault diagnosis

### D3000 5.1 Analog & Digital Breadboard

- A high quality breadboarding facility
- A range of teaching component sets and laboratory manuals

### D3000 5.5 2mm Matrix Patching Board Module

- Electronics patching system based on carrier-mounted components
- A range of teaching component sets and laboratory manuals

## Applied Electronics

### D3000 12.1 Avionics-1

- Single engine aircraft electrical systems
- Single engine power distribution systems
- Single engine power supply systems
- Cessna single engine aircraft electrical systems
- Single engine internal and external lighting systems

### D3000 12.2 Avionics-2

- Stall warning systems
- Take off warning systems
- Temperature systems
- Fuel quantity and fuel flow measurement

### D3000 7.00 Auto Electronic Circuits

- Simple circuits and measurements
- Lamps in series circuits
- Lamps in parallel circuits
- Lamps in series-parallel circuits
- Switches
- Resistance

### D3000 7.01 Auto Lighting Circuits

- Interior light circuits
- Brake (stop) circuit
- Reverse (backup) circuit
- Relay circuits
- Enrichment activities

### D3000 7.02 Motorcycle Lighting Circuits

- Brake (stop) circuit
- Dip/main (Lo/Hi) beam circuit
- Hazard warning circuit
- Direction indicator (turn signal) circuit
- Introduction to headlamp circuits
- Relay circuits
- Enrichment activities



### D3000 7.1 Automotive Electrics

- Battery and fuse
- Starter and solenoid
- Horn and relay
- Parking and headlight
- Indicators and hazards

### D3000 7.2 Ignition Systems

- Semiconductor basic principles
- Contact breaker ignition systems
- Electronic ignition systems
- Spark plugs
- Dynamo and alternator charging systems

### D3000 7.3 Engine Control and Management

- Fuel system electronics - the basics
- Transducers
- Computers
- Actuators
- Emission control

### D3000 7.4 Vehicle Displays and Diagnostics

- Instrument cluster
- Levels & lighting
- Passenger safety
- Trip computer

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## Microprocessors and Microcontrollers

### D3000 8.1 6502 Microprocessor Study Module

- Writing 6502 machine code programs
- Program debugging
- Introduction to development systems
- Addressing modes and negative binary numbers
- Programs with loops

This module requires the D3000 DT35 Microprocessor Applications module.

### D3000 8.2 Z80 Microprocessor Study Module

- Writing Z80 machine code programs
- Program debugging
- Introduction to development systems
- Addressing modes and negative binary numbers
- Programs with loops

This module requires the D3000 DT35 Microprocessor Applications module.



#### D3000 8.5 68000 Microprocessor Study Module

- Writing 68000 machine code programs
- Program development and debugging
- Introduction to development systems
- Programs with loops
- Logical and test instructions

This module requires the D3000 DT35 Microprocessor Applications module.

#### D3000 16.1 PIC Microcontroller Study Module

- Binary and hexadecimal number systems
- PIC internal architecture and instruction set
- Basic digital input and output
- Keypad and display scanning - number entry and display
- Sound generation - security and alarm circuits

#### D3000 DT35 Microprocessor Applications Module

This module is supplied in a rugged storage case and includes the following devices:

- 2 x 8-bit input/output ports with LEDs
- Analog-digital converter
- Digital-analog converter
- DC motor with opto-electronic speed sensor
- Optical sender/optical receiver
- Piezo sounder
- Ultrasonic transmitter/receiver

The control of the Microprocessor Applications Module forms the basis of the programming exercises contained in the laboratory manuals provided in the 6502, Z80, and 68000 Microprocessor study modules.

## Instrumentation and Control

No base unit is required with the following modules:

### CA06 PC-based Analog & Digital Motor Control Teaching Set

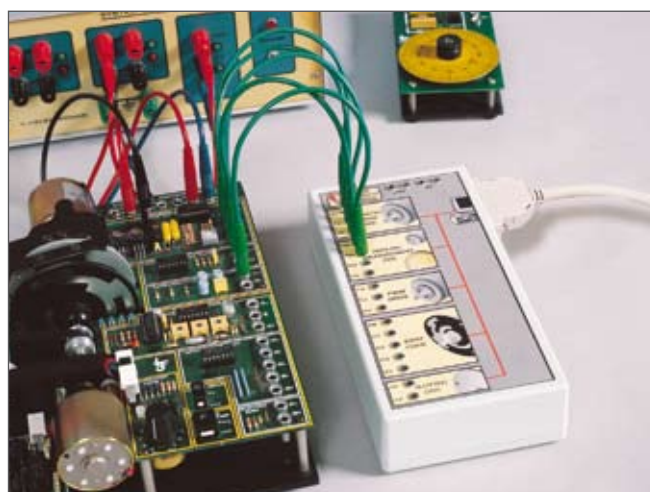
- Time and frequency response
- Principles of feedback
- 3-Term or PID control
- The use of computers for control
- Analog and digital interfacing

### D1750 Transducers and Instrumentation Trainer

- Input transducers and output transducers
- Signal conditioning circuitry
- Control system evaluation
- Practical control systems
- Display devices

### D1760 Data logging for Transducers and Instrumentation

- Uses the V-Lab2 virtual oscilloscope and data logger unit with the D1750 Trainer (see above).
- Monitoring and logging of responses from the following:
  - Temperature control
  - Light level control
  - Proportional motor position control
  - Proportional-integral motor position control
  - Proportional-derivative motor position control
  - PID motor position control
  - Motor speed control



For more information on our electronics teaching resources please contact:

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