



Pullman Academic
Better Learning Outcomes

Working with STEM Cloud – List of Topics



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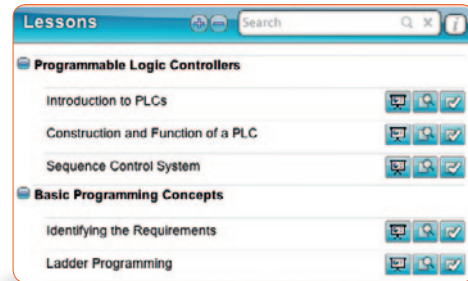
[60 Workplace Problem Solving](#)

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LJ Create Cloud – Putting Interactive Learning into the Classroom, Laboratory, Workshop and Workplace

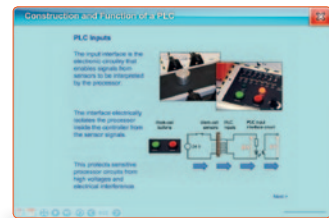
eLEARNING

A wide range of presentations, investigations and assessments to help develop skills and knowledge.

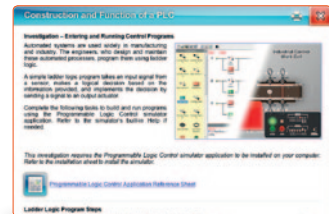


EXAMPLE CONTENT

Presentations



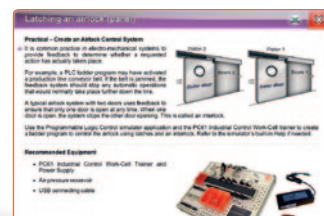
Investigations



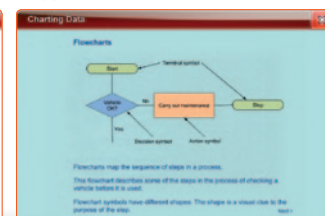
Assessments



Practical Tasks



Support Materials



Our Two-Minute Rule

Once a user has logged in, they are ready to start work with no installation or training required.

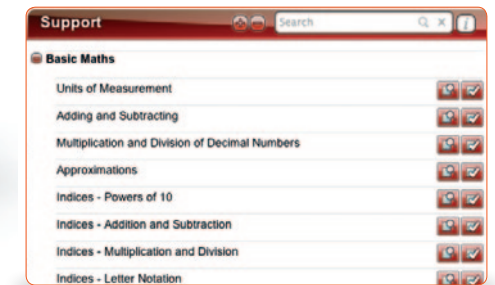
The intuitive menu system has been designed to meet our 'two-minute rule'.

We insist to our content development team that you MUST be able to use our software within two minutes.



ACADEMIC AND TECHNICAL SUPPORT

Resources offering background technical knowledge and academic support for maths and English.



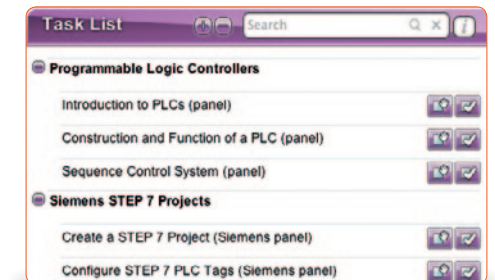
LEARNING MANAGEMENT SYSTEM

Automatically tracks and records student/school progress and attainment.



PRACTICAL TASKS

Hands-on activities linked to theoretical resources provide users with the ability to develop practical skills.





01 Materials Engineering

Topic/Lesson	P	I/P	R
Materials			
Classification of Materials	✓	✓	✓
Iron and Steel	✓	✓	✓
Non-Ferrous Metals	✓	✓	✓
Ceramic and Sintered Materials	✓	✓	✓
Composite Materials	✓	✓	✓
Corrosion	✓	✓	✓
Polymers	✓	✓	✓
Lubrication	✓	✓	✓
Properties of Materials			
Characteristics of Materials	✓	✓	✓
Structure of Materials			
Structure of Metals	✓	✓	✓
Materials Testing - Tensile and Impact Testing	✓	✓	✓
Interpretation of Test Results	✓	✓	✓
Materials Testing - Hardness and Non-Destructive Testing	✓	✓	✓
Solutions and Phases	✓	✓	✓
Microstructure of Metals	✓	✓	✓
Microstructures of Steel	✓	✓	✓
Microstructure of Alloys	✓	✓	✓

02 Engineering Drawing

Topic/Lesson	P	I/P	R
Engineering Drawing			
Drawing Standards	✓	✓	✓
Basic Geometric Construction	✓	✓	✓
Types of View	✓	✓	✓
Co-ordinate Systems	✓	✓	✓
Dimensions	✓	✓	✓
Roughness	✓	✓	✓
Sectional Views	✓	✓	✓
Drawing Analysis	✓	✓	✓
Drawing Elements			
Screws and Threaded Components	✓	✓	✓
Machine Elements	✓	✓	✓
Tolerances and Fits	✓	✓	✓
Drilling and Finishes	✓	✓	✓
Fluid Power Diagrams	✓	✓	✓
Permanent Connections	✓	✓	✓

03 Fluid Power

Topic/Lesson	P	I/P	R
Fluid Power			
Basic Fluid Power Engineering	✓	✓	✓
Fluid Power Concepts	✓	✓	✓
Pressure and Volume	✓	✓	✓
Units in Fluid Power	✓	✓	✓
Fluid Power Formulas	✓	✓	✓
Types of Pressure	✓	✓	✓
Calculations of Pressure and Flow Rate	✓	✓	✓
Hydraulics	✓	✓	✓
Fluid Power Cylinders	✓	✓	✓
Basic Control Valves	✓	✓	✓
Pneumatics Diagrams, Series and Parallel Circuits and Time Delays	✓	✓	✓
Electropneumatics	✓	✓	✓
Logic Controls	✓	✓	✓
Calculations of Hydraulic Power	✓	✓	✓
Starting and Maintaining Fluid Systems	✓	✓	✓



04 Manufacturing Engineering

Topic/Lesson	P	I/P	R
Manufacturing Processes			
Manufacturing Processes	✓	✓	✓
Safety and Protective Measures	✓	✓	✓
Machine Tools and Terminology	✓	✓	✓
Primary Metal Shaping Processes	✓	✓	✓
Cutting Metal	✓	✓	✓
Turning - Processes and Machines	✓	✓	✓
Determining Data for Turning	✓	✓	✓
Milling - Processes and Machines	✓	✓	✓
Determining Data for Milling	✓	✓	✓
Grinding - Processes and Machines	✓	✓	✓
Determining Data for Grinding	✓	✓	✓
Forces on the Cutting Tool	✓	✓	✓
Cutting and Angles of Cutting	✓	✓	✓
Drilling	✓	✓	✓
Cutting Speed for Drilling	✓	✓	✓
Bending	✓	✓	✓
Bending Operation Calculations	✓	✓	✓
Forming Procedures	✓	✓	✓
Forming Calculations	✓	✓	✓
Forming - Material Use and Scrap	✓	✓	✓
Forging	✓	✓	✓
Honing	✓	✓	✓
Erosive Manufacturing Processes	✓	✓	✓
Spark Erosion	✓	✓	✓
Hard Metal Cutting	✓	✓	✓
Finishing Processes	✓	✓	✓
Environmental Protection	✓	✓	✓
Reading Machine Diagrams	✓	✓	✓
Joining			
Joining Procedures	✓	✓	✓
Screw Connections	✓	✓	✓
Joining with Glues	✓	✓	✓
Joining with Soldering	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Joining with Keys and Splines	✓	✓	✓
Joining with Pins, Bolts and Rivets	✓	✓	✓
Lapping	✓	✓	✓
Joining with Threads	✓	✓	✓
Forces on Threads	✓	✓	✓
Forces in Threaded Joints	✓		✓
Formula and Calculation of Tightening Torque	✓	✓	✓
Welding			
Joining with Welding	✓	✓	✓
Gas Welding	✓	✓	✓
Arc Welding	✓	✓	✓
Gas-Shielded Welding	✓	✓	✓
Welding Seam Profile and Electrode Requirements	✓	✓	✓
CNC Programming			
CNC and the Basics of Programming	✓	✓	✓
CNC Programming for Turning	✓	✓	✓
CNC Programming for Milling	✓	✓	✓
Multiple Axis Turning and Milling	✓	✓	✓
Information Technology			
Process Planning	✓	✓	✓
Charting Data	✓	✓	✓
Planning and Organising Work Processes	✓	✓	✓
Measurement			
Measuring with a Caliper, Micrometer, or Dial Gauge	✓		✓



05 Machine and Instrument Engineering

Topic/Lesson	P	I/P	R
Engineering Science			
Mechanical Units	✓	✓	✓
Mass and Volume Flow Rate	✓	✓	✓
Energy, Work and Efficiency	✓	✓	✓
Calculating Work, Power and Efficiency	✓	✓	✓
Transferring Mechanical Energy	✓	✓	✓
Torque and Power	✓	✓	✓
Stress-Strain Analysis	✓	✓	✓
Stress Calculations in Joints	✓	✓	✓
Manufacturing Facilities	✓	✓	✓
Material Conversion	✓	✓	✓
Bearings			
Plain Bearings	✓	✓	✓
Bearings	✓	✓	✓
Rolling-Element Bearings	✓	✓	✓
Bearing Assemblies and Fit	✓	✓	✓
Calculation of Forces on Bearings	✓	✓	✓
Seals and Gaskets	✓	✓	✓
Joining Hubs to Shafts	✓	✓	✓
Gears			
Simple and Compound Gears	✓	✓	✓
Gear Drives	✓	✓	✓
Gear Calculations	✓	✓	✓
Gear Design Factors	✓	✓	✓
Clutches	✓	✓	✓
Traction Drives	✓	✓	✓
Adjustable Speed Transmission	✓	✓	✓

06 Inspection, Maintenance and Quality Management

Topic/Lesson	P	I/P	R
Inspection Technology and Quality Management			
Accuracy	✓	✓	✓
Measuring Lengths	✓	✓	✓
Calculating Lengths	✓	✓	✓
Measurement Tolerances	✓	✓	✓
Tolerance Calculations	✓	✓	✓
Clearances and Fits	✓	✓	✓
Calculation of Clearances and Fits	✓	✓	✓
Quality Management	✓	✓	✓
Statistical Analysis	✓	✓	✓
Maintenance			
Maintenance Principles	✓	✓	✓
Maintenance and Accident Prevention	✓	✓	✓
Maintenance Documentation	✓	✓	✓
Maintenance Inspection	✓	✓	✓
Diagnostics and Troubleshooting	✓	✓	✓
Mechanical Breakdown	✓	✓	✓
Fault Repair	✓	✓	✓



07 Industrial Control

Topic/Lesson	P	I/P	R
Number Systems			
Hexadecimal and Binary Number Systems	✓	✓	✓
Feedback Control Systems			
On/Off Control Systems	✓	✓	✓
The Control Loop	✓	✓	✓
Controller Responses	✓	✓	✓
Programmable Logic Control			
Programmable Logic Controllers (PLCs)	✓	✓	✓
Construction and Function of a PLC	✓	✓	✓
Sequence Control System	✓	✓	✓
Components of a Sequence Control System	✓	✓	✓
PLC Programming	✓	✓	✓
Converting Logical Circuit to Functional Plan	✓	✓	✓
GRAFCET Sequence Control Systems	✓	✓	✓
Using GRAFCET Diagrams	✓	✓	✓
Basic Structure of a PLC	✓	✓	✓
Connecting a PLC	✓	✓	✓
PLC Conveyor System Control			
Introduction to PLCs	✓	✓	✓
Introduction to PLCs		✓	✓
Construction and Function of a PLC	✓	✓	✓
Construction and Function of a PLC		✓	✓
Sequence Control System	✓	✓	✓
Sequence Control System		✓	✓
Identifying the Requirements	✓	✓	✓
Ladder Programming	✓	✓	✓
Latches	✓	✓	✓
Latching an Airlock		✓	✓
Latching an Airlock		✓	✓
Counters	✓	✓	✓
Counting Parts		✓	✓
Counting Parts		✓	✓
Timers	✓	✓	✓
Timers		✓	✓
Memory Stores	✓	✓	✓
Memory Stores		✓	✓
Analogue Inputs	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Analogue Outputs	✓	✓	✓
Using GRAFCET Diagrams		✓	✓
Sorting Parts 1		✓	✓
Sorting Parts 1		✓	✓
Sorting Parts 2		✓	✓
Sorting Parts 2		✓	✓
Create a STEP 7 Project (Siemens panel)		✓	✓
Configure STEP 7 PLC Tags (Siemens panel)		✓	✓
Enter a STEP 7 Ladder Program (Siemens panel)		✓	✓
Run a STEP 7 Ladder Program (Siemens panel)		✓	✓
Flip-Flop Latches (Siemens panel)		✓	✓
Counting Parts (Siemens panel)		✓	✓
Timers (Siemens panel)		✓	✓
Memory Stores (Siemens panel)		✓	✓
Analogue Inputs (Siemens panel)		✓	✓
Analogue Outputs (Siemens panel)		✓	✓
Sorting Parts 1 (Siemens panel)		✓	✓
Sorting Parts 2 (Siemens panel)		✓	✓
PLC Part Sorting Control			
Creating a STEP 7 Project		✓	✓
Configure STEP 7 PLC Tags		✓	✓
Enter a STEP 7 Ladder Program		✓	
Run a STEP 7 Ladder Program		✓	
Flip-Flop Latches		✓	✓
Counting Parts		✓	✓
Timers		✓	✓
Memory Stores		✓	✓
Analogue Inputs		✓	
Analogue Outputs		✓	✓
The Rotary Encoder	✓		✓
The Rotary Encoder		✓	✓
Sorting Parts		✓	✓
Fieldbus Systems			
Introduction to Fieldbus	✓	✓	✓
The AS Interface	✓	✓	✓
Profibus DP	✓	✓	✓



08 Electronic Systems

Topic/Lesson	P	I/P	R
Signal Processing			
Systems and Sub-Systems	✓		✓
Electronic Systems	✓		✓
Inputs, Outputs and Processes	✓	✓	✓
Inputs, Outputs and Processes		✓	
Measurement of Non-Electrical Quantities	✓	✓	✓
Types of Circuit Diagrams	✓	✓	✓
Analogue Signal Processing		✓	✓
Digital Signal Processing		✓	✓
Components			
Alternative Components	✓		✓
Alternative Components		✓	✓
Data and Selection	✓		✓
System Components	✓	✓	✓
Characteristics of Non-Linear Components	✓	✓	✓
Problem Solving - Identify Electronic Components		✓	✓
Problem Solving - Recognize and Select Components		✓	✓
Alarm Systems			
Components of Intruder and Fire Alarms	✓	✓	✓
Components of Intruder and Fire Alarms		✓	
Installing Intruder Alarms and Fire Alarms	✓	✓	✓
Installing Intruder Alarms and Fire Alarms		✓	
Closed Loop Control			
An Example On/Off Control System	✓	✓	✓
Automatic Temperature Control	✓	✓	✓
Automatic Temperature Control		✓	
RC Circuit Responses	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Energy and Power			
Small Energy Sources	✓	✓	✓
Extending System Life	✓	✓	✓
Fault Finding Electronic Systems			
Fault Location Techniques	✓	✓	✓
Faults and Fault Finding Aids	✓		✓
Electronic Systems Maintenance	✓	✓	✓
Fault Conditions	✓		✓
Problem Solving - Testing and Fault Finding on Electronic Components		✓	✓



09 DC Circuits

Topic/Lesson	P	I/P	R
Voltage and Current			
Electrical Principles	✓		✓
Basic Electrical Quantities in Circuits	✓		✓
Units, Multiples and Sub-multiples	✓	✓	✓
Potential Difference and Voltage	✓	✓	✓
The Basic DC Circuit	✓		
Introduction to Electric Current	✓	✓	✓
Measurement in Circuits	✓		✓
Measuring Voltage	✓	✓	✓
Measuring Voltage		✓	✓
Measuring Current in a Circuit (board)		✓	✓
Handling Voltage Calculations	✓	✓	✓
Simple Circuits	✓	✓	✓
Circuit Diagrams	✓	✓	✓
Electric Current and Safety	✓	✓	✓
Resistance			
Relationship between Voltage, Current and Resistance	✓	✓	✓
Resistance and Conductance	✓	✓	✓
Resistance and Conductance Reciprocal Calculations	✓	✓	✓
Resistors	✓		✓
Electrical Power and Resistor Color Coding	✓		
Resistors		✓	✓
Colour Code and Tolerance	✓	✓	✓
Calculating Resistance Colour Code Values and Tolerance	✓	✓	✓
Investigating Whether Resistors are in Tolerance		✓	✓
Measuring Resistance		✓	✓
Resistance Characteristics	✓	✓	✓
Investigating a Characteristic Graph for a Resistive Component		✓	✓
Gradient of Linear Voltage-Current Graphs	✓	✓	✓
Applications of Ohm's Law	✓	✓	✓
Calculating the Resistor Value for an LED Lamp Circuit	✓	✓	✓
Changing the Resistance in an LED Circuit		✓	✓
Resistor Characteristics and Applications	✓		
Non-Linear Resistances	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Electrical Energy and Power			
Electrical Power	✓	✓	✓
Calculation of Electrical Power	✓	✓	✓
Calculating Electrical Power for a Load		✓	✓
Capacitor Circuits			
Capacitors	✓	✓	✓
Capacitance of Capacitors	✓	✓	✓
Interconnection of Capacitors	✓	✓	✓
Calculating Total Capacitance	✓	✓	✓
Capacitors in Series and Parallel		✓	✓
Charging and Discharging a Capacitor	✓	✓	✓
Charging and Discharging a Capacitor		✓	✓
Capacitor Discharge Curve		✓	✓
Capacitor Timing Circuits	✓	✓	✓
Resistance and the Time Constant		✓	✓
Inductor Circuits			
Inductors - Graphs and Equations	✓	✓	✓
Inductors - Graphs and Equations		✓	



10 Electrical Networks

Topic/Lesson	P	I/P	R
Series and Parallel Lamps			
Series Circuits	✓	✓	✓
Parallel Circuits	✓	✓	✓
Series and Parallel Resistors			
Resistors in Series	✓	✓	✓
Resistors in Series		✓	✓
Calculation of Resistors in Series	✓	✓	✓
Series Circuit Calculations	✓	✓	✓
Parallel Resistor Circuits	✓	✓	✓
Resistors in Parallel		✓	✓
Calculation of Resistors in Parallel	✓	✓	✓
Parallel Circuit Calculations	✓	✓	✓
Series and Parallel Resistor Combinations		✓	✓
Series and Parallel Equivalent Resistance	✓	✓	✓
Characteristics of Series and Parallel Connections	✓	✓	✓
Working with Series and Parallel Characteristic Curves	✓	✓	✓
Mathematical Approach to Series and Parallel Circuit Simplification	✓	✓	✓
Voltage Divider Principle			
The Voltage Divider Principle	✓	✓	✓
Voltage Divider Operation		✓	✓
Internal Resistance			
Internal Resistance	✓	✓	✓
Internal Resistance of Power Sources		✓	✓
Kirchhoff's Laws			
Kirchhoff's First Law	✓	✓	✓
Current Behaviour at a Node		✓	
Calculations using Kirchhoff's First Law	✓	✓	✓
Kirchhoff's Second Law	✓	✓	✓
Voltages in a DC Network		✓	✓
Calculations using Kirchhoff's Second Law	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Thevenin's Theorem			
Thevenin's Equivalent Circuits	✓	✓	✓
Thevenin's Equations	✓	✓	✓
Superposition Principle			
The Superposition Principle	✓	✓	✓
Applying the Superposition Principle	✓	✓	✓
Measuring Instruments			
Absolute and Relative Measurement Errors	✓	✓	✓
Handling Measurement Errors	✓	✓	✓
Extending the Range of a Voltmeter	✓	✓	✓
Calculating the Extension of the Range of a Voltmeter	✓	✓	✓
Measuring Current and Extending Ammeter Range	✓	✓	✓
Calculating the Extension of the Range of an Ammeter	✓	✓	✓



11 AC Circuits

Topic/Lesson	P	I/P	R
AC Principles			
Introduction to Alternating Current	✓	✓	✓
Alternating Current Equations	✓	✓	✓
Effective Values of Alternating Voltages and Currents	✓	✓	✓
Calculating the Effective Values of Alternating Voltages and Currents	✓	✓	✓
Measuring with an Oscilloscope	✓	✓	✓
Amplitude and Timebase Settings of an Oscilloscope	✓	✓	✓
Period and Frequency		✓	✓
Peak, Peak-to-Peak and RMS Values		✓	✓
Capacitor Circuits			
Capacitors in AC Circuits	✓	✓	✓
Capacitors in AC Circuits		✓	✓
Calculations on Capacitive Reactance with Graphical Representation	✓	✓	✓
RC Circuits	✓	✓	✓
Graphical Representation and Equations of RC Circuits	✓	✓	✓
Inductor Circuits			
Inductors in AC Circuits	✓	✓	✓
Inductors in AC Circuits		✓	✓
Calculations on Inductive Reactance with Graphical Representation	✓	✓	✓
RL Circuits	✓	✓	✓
Graphical Representations and Equations of RL Circuits	✓	✓	✓
RLC Circuits			
RLC Circuits	✓	✓	✓
Graphical Representation and Equations of RLC Circuits	✓	✓	✓
Phase Difference and Power	✓	✓	✓
Graphical Representation of Phase Difference and Power	✓	✓	✓
Power in RLC Circuits	✓	✓	✓
Calculating Power in RLC Circuits	✓	✓	✓
LC Oscillator Circuit	✓	✓	✓
Calculating the Resonant Frequency of an LC Oscillator Circuit	✓	✓	✓

12 Magnetism and Electromagnetism

Topic/Lesson	P	I/P	R
Magnetic and Electromagnetic Principles			
Magnetic Principles	✓	✓	✓
Electromagnetism	✓	✓	✓
Electromagnetism		✓	
Self Inductance of Inductors	✓	✓	✓
Self-Inductance of Inductors		✓	
Magnetic Flux and Flux Density	✓	✓	✓
Magnetic Flux and Flux Density Calculations	✓	✓	✓
Transformers			
Transformers	✓	✓	✓
Transformers		✓	
Transformer Calculations	✓	✓	✓
Transformer Calculations		✓	
DC Motor			
The DC Motor	✓	✓	✓
The DC Motor		✓	
Characteristics of the DC Motor	✓	✓	✓
Characteristics of the DC Motor		✓	
Fault Finding Electromagnetic Devices			
Fault Finding Electromagnetic Devices W1		✓	✓
Fault Finding Electromagnetic Devices W2		✓	
Fault Finding Electromagnetic Devices W3		✓	
Fault Finding Electromagnetic Devices W4		✓	✓



13 Electrical Engineering

Topic/Lesson	P	I/P	R
Electrical Connections in Buildings			
Electrical Installation in Residential Buildings	✓	✓	✓
Components of an Electrical Installation	✓	✓	✓
Light and Lighting	✓	✓	✓
Planning Lighting Systems	✓	✓	✓
Technology in the Home - Heating	✓	✓	✓
Technology in the Home - Cooling	✓	✓	✓
Technical Building Management System	✓	✓	✓
Bus System	✓	✓	✓
Electrical Safety and Accident Prevention			
Dangers of Electric Current for Humans	✓	✓	✓
Safeguards Against Electric Shock	✓	✓	✓
Effect of Electric Current on the Human Body	✓	✓	✓
Safeguards against Electric Shock	✓	✓	✓
Dealing with a Victim of an Electric Shock	✓	✓	✓
Earthing Systems	✓	✓	✓
TN Earthing Systems	✓	✓	✓
Designing for Safety	✓	✓	✓
Cables and Wires	✓	✓	✓
Voltage Drop in Cables and Wires	✓	✓	✓
Minimum Safe Cross-Sectional Area of Wires	✓	✓	✓
Circuit Breakers	✓	✓	✓
Consumer Units	✓	✓	✓
Re-Testing to Electrical Standards	✓	✓	✓
Ingress Protection and IP Codes	✓	✓	✓
Generating and Distributing Electric Energy			
Production, Transmission and Distribution of Electrical Energy	✓	✓	✓
Energy Distribution Calculations	✓	✓	✓

14 Linear Electronics

Topic/Lesson	P	I/P	R
Analogue Circuits			
Types of Analogue Circuits	✓	✓	✓
Operational Amplifier Circuits			
Operational Amplifiers	✓	✓	✓
Comparator		✓	✓
Inverting and Non-inverting Operational Amplifier Circuits	✓	✓	✓
Investigating Inverting Op-amp circuits		✓	✓
Investigating Non-Inverting Op-amp circuits		✓	✓
Operational amplifier with AC input (simulator)		✓	✓
High Frequency Performance of an Operational Amplifier		✓	✓
Analogue ICs			
IC Sensors	✓	✓	✓
The 555 Oscillator/ Timer	✓	✓	✓
Analogue Switches	✓	✓	✓
Switched Capacitor Filters	✓	✓	✓
Power Supplies			
A DC Power Supply	✓	✓	✓
Voltage Stabilisers	✓	✓	✓
Voltage Regulators	✓	✓	✓
Fault Finding Linear Electronic Circuits			
Planning a Fault Location Strategy	✓	✓	✓
Planning a Fault Location Strategy		✓	
Fault Finding Operational Amplifier Circuits W1		✓	✓
Fault Finding Operational Amplifier Circuits W2		✓	
Fault Finding Operational Amplifier Circuits W3		✓	
Fault Finding Operational Amplifier Circuits W4		✓	✓
Fault Finding Linear Electronic Circuits W1		✓	✓
Fault Finding Linear Electronic Circuits W2		✓	
Fault Finding Linear Electronic Circuits W3		✓	
Fault Finding Linear Electronic Circuits W4		✓	✓



15 Semiconductors

Topic/Lesson	P	I/P	R
Diodes			
Diode Operation	✓	✓	✓
Diode Characteristics		✓	✓
Diode Rectifiers	✓	✓	✓
Rectifier Circuits	✓	✓	✓
Simple Rectifier Circuit		✓	✓
Diode Rectifier Calculations	✓	✓	✓
Light Emitting Diodes	✓	✓	✓
Zener Diodes	✓	✓	✓
Voltage Stabilisation with Zener Diodes	✓	✓	✓
Voltage Stabilisation with Zener Diodes		✓	✓
Transistors			
Transistors	✓	✓	✓
Bipolar Transistor Characteristics	✓	✓	✓
Analysing Transistor Characteristics	✓	✓	✓
Transistor as a Switch	✓	✓	✓
PNP Transistor Switch		✓	✓
Transistor Characteristics and Circuit Calculations	✓	✓	✓
Comparison of Electronic and Electromechanical Switches	✓	✓	✓
The Darlington Pair and the FET		✓	✓
Field Effect Transistor Operation		✓	✓
Field Effect Transistor Amplifier		✓	✓
Transistor Amplifiers			
Transistor Amplifier - Voltage Amplification	✓		
The Transistor as a Voltage Amplifier		✓	✓
Effects of Feedback in a Transistor Amplifier Circuit	✓	✓	✓
Transistor Amplifier - Effect of Bias	✓		
The Emitter Follower	✓		
Gain, Loss and Noise	✓	✓	✓
Classes of Transistor Amplifiers	✓	✓	✓
Class A Transistor Amplifier		✓	✓
Biasing a Transistor Amplifier		✓	✓
Class B and AB Transistor Amplifiers		✓	✓
Class C Transistor Amplifier		✓	✓

Cont.

Topic/Lesson	P	I/P	R
SCRs			
Thyristor Operation	✓	✓	✓
Thyristor		✓	✓
Characteristics of Thyristors	✓	✓	✓
Display Devices			
A 7-Segment Display	✓		✓
7-Segment Display and Decoder		✓	✓
Optoelectronic Display Devices	✓	✓	✓
Fault Finding Semiconductor Circuits			
Test Data Records	✓		✓
Fault Finding Semiconductor Circuits W1		✓	✓
Fault Finding Semiconductor Circuits W2		✓	
Fault Finding Semiconductor Circuits W3		✓	
Fault Finding Semiconductor Circuits W4		✓	✓
Fault Finding Transistor Amplifiers W1		✓	✓
Fault Finding Transistor Amplifiers W2		✓	
Fault Finding Transistor Amplifiers W3		✓	
Fault Finding Transistor Amplifiers W4		✓	✓



16 Power Electronics

Topic/Lesson	P	I/P	R
Three-phase AC			
Generation of Three-phase AC	✓	✓	✓
Representation of Three-phase AC	✓	✓	✓
Star Connection	✓	✓	✓
Star Calculations	✓	✓	✓
Delta Connection	✓	✓	✓
Delta Calculations	✓	✓	✓
Motors and Motor Control			
Electric Motors	✓		✓
The Induction Motor	✓	✓	✓
Characteristics of an Induction Motor	✓	✓	✓
Motor Starting and Speed Control	✓	✓	✓
Speed Control of Induction Motors	✓	✓	✓
The Single-phase AC Motor	✓	✓	✓
Starting a Single-Phase AC Motor	✓	✓	✓
Connecting a Motor	✓	✓	✓
Motor Drive Connection Components	✓	✓	✓
Energy and Power			
Efficiency of Electric Motors	✓	✓	✓
Efficiency Formulas for Electric Motors	✓	✓	✓
Contactors			
Construction of a Contactor	✓	✓	✓
Selection of Contactors	✓	✓	✓
Controlling Contactors	✓	✓	✓
Latching in Contactor Circuits	✓	✓	✓
Current Flow in Latching Circuits	✓	✓	✓
Motor Protection			
Motor Installations and Safety	✓	✓	✓
Interlock Systems	✓	✓	✓
Motor Protection	✓	✓	✓
Motor Drive Protection Circuit	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Frequency Converters			
Construction and Function of Frequency Converters	✓	✓	✓
Commissioning of Frequency Converters	✓	✓	✓
Frequency Converter Parameters	✓	✓	✓
Connecting a Frequency Converter	✓	✓	✓
EMC	✓	✓	✓
Frequency Filters	✓	✓	✓



17 Digital Electronics

Topic/Lesson	P	I/P	R
Number Systems			
Conversion Between Number Systems	✓	✓	✓
Calculations in Binary	✓	✓	✓
Combinational Logic			
Basic Logic Functions and Their Algebra	✓	✓	✓
Logic Gates		✓	✓
Logic Gates		✓	✓
TTL Logic Gate Input and Output Characteristics	✓		
TTL Input and Output Characteristics	✓		
Characteristics of a Schmitt Inverter Gate	✓		
Characteristics of the EX-OR and EX-NOR Circuit	✓		
Logic Families	✓		✓
Boolean Algebra	✓		✓
Boolean Expressions from Logic Circuits		✓	
Combinational Logic	✓		✓
Circuits involving Combinational Logic	✓	✓	✓
Building EXOR Gates from Other Gates		✓	✓
Boolean Algebra and De Morgan's Theorems	✓		
Equivalent Logic Circuits		✓	
Karnaugh Maps	✓	✓	✓
Karnaugh Maps	✓		
Sequential Logic			
Integrated Circuit Memory	✓	✓	✓
Bistable Devices	✓	✓	✓
The S-R Latch	✓		
The S-R Latch Constructed From NAND Gates		✓	✓
Characteristics of a D-Type Flip-Flop	✓		
D-Type Flip-Flop		✓	✓
Characteristics of a J-K Flip-Flop	✓		
The J-K Flip-Flop		✓	✓
Binary Counters	✓		
Counting with Bistables (simulator)		✓	✓
Counters	✓	✓	✓
Synchronous counters		✓	✓
Shift Registers	✓	✓	✓
Characteristics of a D-Type 2-bit Shift Register	✓		
Interfacing			
Industry Standards	✓		✓
Standard Interfaces	✓		✓
Tri-State Devices and Data Access	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Tri-State Logic	✓		
Bi-directional line drivers		✓	✓
Signal Processing			
Digital Signal Processing	✓	✓	✓
Sensors	✓	✓	✓
Physical Environment to Electrical Transformation	✓	✓	✓
Digital Systems			
Types of Digital Circuits	✓	✓	✓
Binary Counters and 7-Segment Displays	✓		
Binary-Coded Decimal Counters	✓		✓
Encoders and Decoders	✓	✓	✓
Multiplexers and Demultiplexers	✓	✓	✓
Multiplexers and Demultiplexers	✓		
Signal Converters	✓		
Digital to Analogue Conversion	✓	✓	✓
Analogue to Digital Conversion	✓	✓	✓
Characteristics of an Analog Comparator	✓		
Ramp Generator	✓		
Testing Digital Systems	✓	✓	✓
Fault Finding Digital Circuits			
Calculating Expected Operating Conditions	✓	✓	✓
Calculating Expected Operating Conditions		✓	
Fault-Finding Aids and Reporting	✓	✓	✓
Testing a Faulty Logic Circuit		✓	
Signal Tracing Techniques	✓	✓	✓
Test Instruments	✓	✓	✓
Fault Finding A/D and D/A Circuits W1		✓	✓
Fault Finding A/D and D/A Circuits W2		✓	
Fault Finding A/D and D/A Circuits W3		✓	
Fault Finding A/D and D/A Circuits W4		✓	✓
Fault Finding Encoding/ Decoding Circuits W1		✓	✓
Fault Finding Encoding/ Decoding Circuits W2		✓	
Fault Finding Encoding/ Decoding Circuits W3		✓	
Fault Finding Encoding/ Decoding Circuits W4		✓	✓
Fault Finding Multiplexing/ Demultiplexing Circuits W1		✓	✓
Fault Finding Multiplexing/ Demultiplexing Circuits W2		✓	
Fault Finding Multiplexing/ Demultiplexing Circuits W3		✓	
Fault Finding Multiplexing/ Demultiplexing Circuits W4		✓	✓
Faults in Shift Register Circuits		✓	✓
Faults in Ring Counter Circuits		✓	✓



18 Telecommunications

Topic/Lesson	P	I/P	R
Electronic Communication Principles			
Electronic Communication Systems	✓		✓
AM Transmission		✓	✓
Optical Transmission		✓	✓
Simplex and Duplex Transmission		✓	✓
Phase Locked Loops	✓	✓	✓
Digital Data Transmission			
Digital Data Transmission	✓	✓	✓
Transmission Protocols	✓	✓	✓
Handshaking and flow control		✓	✓
Antennas			
Installing Antenna and Broadband Connections	✓	✓	✓
Antenna and Broadband Options	✓	✓	✓
Fault Finding Telecommunication Circuits			
Fault Finding Telecommunication Circuits W1		✓	✓
Fault Finding Telecommunication Circuits W2		✓	
Fault Finding Telecommunication Circuits W3		✓	
Fault Finding Telecommunication Circuits W4		✓	✓

19 Microprocessors

Topic/Lesson	P	I/P	R
Microprocessor System Applications			
Microprocessor System Applications	✓	✓	✓
Program Development			
Entering and Running a Program	✓	✓	✓
Designing a Program	✓	✓	✓
Architecture and Operation of a Microprocessor			
Architecture	✓	✓	✓
Principles of Operation	✓		✓
Number Systems, Instructions and Subroutines			
Number Systems	✓	✓	✓
Instruction Groups	✓	✓	✓
Subroutines and the Stack	✓	✓	✓
Developing PIC Programs			
Debugging Programs	✓	✓	✓
Controlling a Motor		✓	✓
Using Feedback		✓	✓
Full Washing Machine Sequence		✓	✓
Memory			
Embedded Computers and RAM/Flash Memory	✓	✓	✓



20 Circuit Construction and Testing

Topic/Lesson	P	I/P	R
Safety and Accident Prevention			
Safety Awareness	✓		
Safe Working Practices		✓	✓
Workplace Hazards	✓		✓
Risk Assessment of Electrical Dangers	✓	✓	✓
Lamp Circuit			
Simple Lamp Circuit	✓	✓	✓
The Lamp Circuit		✓	✓
Simulators			
Computer based design and Testing	✓		✓
Polarity Tester			
Building and Testing a Polarity Tester	✓	✓	✓
Building and Testing a Polarity Tester (simulator)		✓	✓
Diagnosing Fault Conditions			
Fault Rectification	✓	✓	✓
LED Lamp Circuit			
Building an LED Lamp Circuit (simulator)		✓	✓
Building an LED Lamp Circuit		✓	✓
Testing a Faulty LED Lamp Circuit (board)		✓	✓
Automatic Light Circuit			
Building and Testing an Automatic Light Circuit	✓		✓
Building and Testing an Automatic Light Circuit (simulator)		✓	✓
Building and Testing an Automatic Light Circuit		✓	✓
Testing a Faulty Automatic Light Circuit		✓	✓
Testing a Faulty Automatic Light Circuit (320 board)		✓	
Building on Breadboard			
Breadboarding	✓		✓
Planning an Automatic Light Circuit on Breadboard	✓		✓
Building the Automatic Light Circuit on Breadboard		✓	✓
Improved Automatic Light Circuit			
Building and Testing an Improved Automatic Light Circuit	✓	✓	✓
Building and Testing an Improved Automatic Light Circuit (board)		✓	✓
Testing a Faulty Improved Automatic Light Circuit (320 board)		✓	✓
Freezer Temperature Warning Circuit			
Building the Freezer Temperature Warning Circuit on Breadboard	✓		✓
Building the Freezer Temperature Warning Circuit on Breadboard		✓	✓
Intruder Alarm			
Intruder Alarm Circuit	✓		✓
Intruder Alarm Circuit (Simulator)		✓	✓
Intruder Alarm Circuit		✓	✓

Cont.

Topic/Lesson	P	I/P	R
Simulated Latched Buzzer Circuit (simulator)		✓	✓
Latched Buzzer Circuit		✓	✓
Building on Stripboard			
Building Circuits on Stripboard	✓		✓
Planning an Anti-Theft Device	✓	✓	✓
Planning an Anti-Theft Device		✓	✓
Building and Testing the Anti-Theft Device		✓	✓
Flashing Doorbell Circuit			
Flashing Doorbell Circuit	✓	✓	✓
Using an Oscilloscope (board)		✓	✓
Building a Flashing Doorbell Circuit (simulator)		✓	✓
Building a Flashing Doorbell Circuit		✓	✓
Testing a Faulty Flashing Doorbell Circuit 1 (board)		✓	
Testing a Faulty Flashing Doorbell Circuit 2 (board)		✓	✓
Building Circuits on Printed Circuit Boards			
Building Circuits on PCB	✓		✓
Constructing the Continuity Tester on PCB	✓		✓
Constructing the Continuity Tester on PCB		✓	✓
Elevator Door Controller			
The Elevator Door Controller	✓	✓	✓
The Elevator Door Controller (simulator)		✓	✓
Testing a Faulty Elevator Door Controller 1 (board)		✓	
Testing a Faulty Elevator Door Controller 2 (board)		✓	✓
AC to DC Converter			
AC to DC Concepts and Principles	✓	✓	✓
Circuit Breakers and Fuses		✓	✓
A Simple AC to DC Converter	✓		✓
A Simple AC to DC Converter		✓	✓
Baby Alarm			
Building a Baby Alarm	✓	✓	✓
Building a Baby Alarm (board)		✓	✓
Testing a Faulty Baby Alarm 1 (board)		✓	✓
Testing a Faulty Baby Alarm 2 (board)		✓	✓
Road Crossing Controller			
Road Crossing Controller	✓	✓	✓
Road Crossing Controller		✓	✓
Electronic Problem Solving			
Problem Solving - Produce an Electronic Circuit Diagram (simulator)		✓	✓
Problem Solving - Plan, Construct and Test an Electronic Circuit		✓	✓
Problem Solving - Construct an Electronic Circuit		✓	✓



21 Electronic Principles (D3000 Practice)

Topic/Lesson	P	I/P	R
DC Principles			
The Basic DC Circuit - Exercise 1.1		✓	✓
Resistance			
Ohm's Law - Exercise 2.1		✓	✓
Resistor Color Coding for Low Power Resistors - Exercise 4.1		✓	✓
Resistor Color Coding for Low Power Resistors - Worksheet 2		✓	
Resistor Color Coding for Low Power Resistors - Worksheet 3		✓	
Variable Resistor Characteristics and Applications - Exercise 8.1		✓	
Variable Output Voltage using the Potentiometer Connection - Exercise 8.2		✓	✓
Controlling a Lamp with a Variable Resistor - Exercise 9.1		✓	
Controlling a Lamp with a Variable Resistor - Worksheet 7		✓	
Controlling a Lamp with a Variable Resistor - Worksheet 8		✓	
Resistance Measurement using a Wheatstone Bridge - Exercise 11.1		✓	✓
Resistance Measurement using a Wheatstone Bridge - Worksheet 11		✓	
Resistance Measurement using a Wheatstone Bridge - Worksheet 12		✓	
Electrical Networks			
Resistors in Series (circuit board)		✓	✓
Resistors Connected in Series - Exercise 5.1		✓	
Voltage Dividing with Series Resistors - Exercise 5.2		✓	✓
Parallel Resistor Circuits (circuit board)		✓	✓
Resistors Connected in Parallel - Exercise 6.1		✓	
Voltage and Current Relationships for Parallel Connected Circuits - Exercise 6.2		✓	✓
Series-Parallel Connected Circuits - Exercise 7.1		✓	✓
Series-Parallel Connected Circuits - Worksheet 4		✓	
Series-Parallel Connected Circuits - Worksheet 5		✓	
Series-Parallel Connected Circuits - Worksheet 6		✓	
Series-Parallel Circuit Exercise - Exercise 10.1		✓	✓
Series-Parallel Circuit Exercise - Worksheet 9		✓	
Series-Parallel Circuit Exercise - Worksheet 10		✓	
Thevenin's Equivalent Circuits (circuit board)		✓	✓
Electrical Energy and Power			
Power in a Resistor - Exercise 3.1		✓	✓
Power in a Resistor - Worksheet 1		✓	
Power Dissipated in a Lamp Circuit - Exercise 9.2		✓	✓
AC Principles			
Sinusoidal Alternating Waveforms - Exercise 1.1		✓	
Sinusoidal Alternating Waveforms Peak and RMS Values - Exercise 1.2		✓	✓
Alternating Supply with Pure Resistance Loading - Exercise 2.1		✓	
Alternating Supply with Pure Resistance Loading - Worksheet 1		✓	
Voltage and Current Phase Relationships - Exercise 2.2		✓	
Resistances in Series - Exercise 2.3		✓	
Resistances in Parallel - Exercise 2.4		✓	✓
Ground Return Currents - Exercise 11.3		✓	✓

Cont.

Topic/Lesson	P	I/P	R
Capacitor Circuits			
AC Supply with Pure Capacitive Loading - Exercise 4.1		✓	
AC Supply with Pure Capacitive Loading - Worksheet 2		✓	
Variation of Capacitive Reactance with Capacitance - Exercise 4.2		✓	
Capacitors in Parallel on an AC Supply - Exercise 4.3		✓	
Capacitors in Series on an AC Supply - Exercise 4.4		✓	
Capacitor AC Voltage Divider Circuit - Exercise 4.5		✓	✓
Resistance-Capacitance Circuits on AC Supplies - Series - Exercise 6.1		✓	
Resistance-Capacitance Circuits on AC Supplies - Parallel - Exercise 6.2		✓	✓
Inductor Circuits			
Inductance with Square Wave and Sinusoidal Voltage Input - Exercise 3.2		✓	✓
AC Supply with Pure Inductive Loading - Exercise 5.1		✓	
AC Supply with Pure Inductive Loading - Worksheet 3		✓	
AC Supply with Pure Inductive Loading - Worksheet 4		✓	
Inductors in Series on an AC Supply - Exercise 5.2		✓	
Inductors in Parallel on an AC Supply - Exercise 5.3		✓	
Voltage Dividing with Inductors in Series on an AC Supply - Exercise 5.4		✓	✓
Resistance-Inductance Circuits on AC Supplies - Series - Exercise 7.1		✓	
Resistance - Inductance Parallel Circuits on an AC Supply - Exercise 7.2		✓	✓
Resistance-Inductance Circuits on AC Supplies - Worksheet 5		✓	
Resistance-Inductance Circuits on AC Supplies - Worksheet 6		✓	
Resistance-Inductance Filters - Exercise 9.2		✓	✓
RLC Circuits			
Capacitance/Inductance fed from Square and Sinusoidal Inputs - Exercise 3.1		✓	
Resistance-Inductance-Capacitance Circuits on AC Supplies - Exercise 8.1		✓	
Inductance-Capacitance Parallel Circuit on an AC Supply - Exercise 8.2		✓	
Inductance-Capacitance Parallel Circuit on an AC Supply - Exercise 8.3		✓	✓
RLC Circuits on AC Supplies - Worksheet 7		✓	
RLC Circuits on AC Supplies - Worksheet 8		✓	
RLC Circuits on AC Supplies - Worksheet 9		✓	
Resistance-Inductance and Resistance-Capacitance Filter Circuits - Exercise 9.1		✓	
Resistance-Inductance & Resistance-Capacitance Filter Circuits - Worksheet 10		✓	
Transformer			
The Transformer - Exercise 10.1		✓	
Transformer Characteristics on Load - Exercise 10.2		✓	
Application of Transformers to Impedance Matching - Exercise 10.3		✓	✓
The Transformer - Worksheet 11		✓	
The Transformer - Worksheet 12		✓	
Transformer Isolation - Exercise 11.1		✓	
Transformer Isolation in a Resistor Network - Exercise 11.2		✓	



22 Semiconductors (D3000 Practice)

Topic/Lesson	P	I/P	R
Diodes			
Diode Forward Characteristic (board) - Exercise 1.1		✓	
Diode Reverse Characteristic (board) - Exercise 1.2		✓	
Testing a Diode (board) - Exercise 1.3		✓	✓
P-N Junction Diode - Worksheet 1		✓	
P-N Junction Diode - Worksheet 2		✓	
Half-Wave Rectifier - Exercise 2.1		✓	
Reservoir Capacitor - Exercise 2.2		✓	
Negative Power Supply - Exercise 2.3		✓	✓
Half-Wave Rectifier - Worksheet 3		✓	
Bridge Rectifier - Exercise 3.1		✓	
Effect of Reservoir Capacitor - Exercise 3.2		✓	✓
Bridge Rectifier - Worksheet 4		✓	
Zener Diode Characteristic - Exercise 4.1		✓	
Zener Diode Stabilizer Currents - Exercise 4.2		✓	
Variation of Load Current - Exercise 4.3		✓	✓
Zener Diode - Worksheet 5		✓	
Transistors			
Bipolar Transistor Characteristics (circuit board)		✓	✓
Transistor Characteristics - Current Gain - Exercise 5.1		✓	
Transistor Output Characteristic - Exercise 5.2		✓	
Transistor Testing - Exercise 5.3		✓	✓
Transistor Characteristics - Worksheet 6		✓	
The Transistor as a Simple Switch - Exercise 10.1		✓	
Regenerative Switch - Exercise 10.2		✓	✓
The Transistor as a Switch - Worksheet 11		✓	

Cont.

Topic/Lesson	P	I/P	R
Transistor Amplifiers			
Transistor Amplifier - Voltage Amplification - Exercise 6.1		✓	
Need for Bias - Exercise 6.2		✓	
Stage Gain and Input Impedance - Exercise 6.3		✓	✓
Collector Feedback Stabilization - Exercise 7.1		✓	
Base Potential Divider Stabilized Amplifier - Exercise 7.2		✓	
Emitter Decoupling Capacitor - Exercise 7.3		✓	
Fault Diagnosis - Preparatory Investigation 1		✓	✓
Bias Stabilization - Worksheet 7		✓	
Bias Stabilization - Worksheet 8		✓	
Common Collector Amplifier (Emitter Follower) - Exercise 8.1		✓	
PNP Common Emitter Amplifier - Exercise 8.2		✓	✓
Two-Stage Amplifier - Exercise 9.1		✓	
Frequency Response of a Two-Stage Amplifier - Exercise 9.2		✓	
Fault Diagnosis - Preparatory Investigation 2		✓	✓
Two-Stage Amplifier - Worksheet 9		✓	
Two-Stage Amplifier - Worksheet 10		✓	



23 Power Electronics (D3000 Practice)

Topic/Lesson	P	I/P	R
Three-Phase Supplies			
The Three-Phase Supply - Exercise 1.1		✓	✓
6-Wire, 3-Wire and 4-Wire Connections, Delta/Delta Connection - Exercise 2.1		✓	
3-Wire Connection of a 3-Phase Supply (Delta/Delta Connection) - Exercise 2.2		✓	✓
6-Wire, 3-Wire and 4-Wire Connections, Delta/Delta Connection - Worksheet 1		✓	
6-Wire, 3-Wire and 4-Wire Connections, Delta/Delta Connection - Worksheet 2		✓	
Delta/Wye Connection - Exercise 3.1		✓	✓
Delta/Wye Connection - Worksheet 3		✓	
Wye/Wye Connection - Balanced - Exercise 4.1		✓	
Wye/Wye Connection - Unbalanced - Exercise 4.2		✓	✓
Wye/Wye Connection - Worksheet 4		✓	
Wye/Delta Connection - Exercise 5.1		✓	
Wye/Delta System - Phase - Exercise 5.2		✓	✓
Wye/Delta Connection - Worksheet 5		✓	
AC Motors			
AC Motor Principles, and the Three-Phase Synchronous Motor - Exercise 6.1		✓	
Wye Connection of a 3-Phase Synchronous Motor to Wye Supply - Exercise 6.2		✓	
Delta Connection of a 3-Phase Synchronous Motor to Wye Supply - Exercise 6.3		✓	✓
AC Motor Principles, and the Three-Phase Synchronous Motor - Worksheet 6		✓	
Single-Phase Synchronous Motor - Exercise 7.1		✓	
Capacitor Offset - Exercise 7.2		✓	✓
Single-Phase Synchronous Motor - Worksheet 7		✓	
Power Factor Correction - Exercise 8.1		✓	✓
Power Factor Correction - Worksheet 8		✓	
Other AC Motors - Exercise 9.1		✓	✓

Cont.

Topic/Lesson	P	I/P	R
Three-Phase Rectifiers and Inverters			
Half-Wave Rectifier - Exercise 10.1		✓	
Negative DC Supply - Exercise 10.2		✓	
Full-Wave Rectifier - Exercise 10.3		✓	
Dual-Polarity Supplies - Exercise 10.4		✓	✓
Three-Phase Rectifiers - Worksheet 9		✓	
Three-Phase Rectifiers - Worksheet 10		✓	
Three-Phase Inverter and Over-Current Protection - Exercise 11.1		✓	
Over-Current Protection - Exercise 11.2		✓	✓
Three-Phase Inverter and Over-Current Protection - Worksheet 11		✓	



24 Digital Electronics (D3000 Practice)

Topic/Lesson	P	I/P	R
Number Systems			
Number Systems - Measurement of Voltage Levels - Exercise 1.1		✓	✓
Number Systems - Worksheet 1		✓	
Number Systems - Worksheet 2		✓	
Combinational Logic			
Series and Parallel Connection of Switches - Exercise 2.1		✓	✓
Switch Logic - Worksheet 3		✓	
Diode AND and OR Gate Characteristics - Exercise 3.1		✓	✓
Diode Logic - Worksheet 4		✓	
Transistor Inverter Characteristics - Exercise 4.1		✓	
Diode-Transistor Logic Gate Characteristics - Exercise 4.2		✓	✓
Diode-Transistor Logic (DTL) - Worksheet 5		✓	
Diode-Transistor Logic (DTL) - Worksheet 6		✓	
TTL Logic Truth Tables - Exercise 5.2		✓	✓
Transistor-Transistor Logic (TTL) Gates - Worksheet 7		✓	
Transistor-Transistor Logic (TTL) Gates - Worksheet 8		✓	
Equivalent Logic Circuits 1 - Exercise 6.1		✓	
Equivalent Logic Circuits 2 - Exercise 6.2		✓	
Equivalent Logic Circuits 3 - Exercise 6.3		✓	✓
Karnaugh Maps - Exercise 7.1		✓	
Three-Variable Karnaugh Maps - Exercise 7.2		✓	
Four-Variable Karnaugh Maps - Exercise 7.3		✓	✓
Characteristics of a Schmitt Inverter Gate - Exercise 9.1		✓	✓
Characteristics of the Wired-AND Circuit - Exercise 10.1		✓	
Characteristics of the Wired-NOR Circuit - Exercise 10.2		✓	✓
Open Collector Gates - Worksheet 9		✓	
Open Collector Gates - Worksheet 10		✓	
Characteristics of the EX-OR and EX-NOR Circuit - Exercise 1.1		✓	
Characteristics of the Half Adder Circuit - Exercise 1.2		✓	✓
EX-OR and EX-NOR Gates - Worksheet 1		✓	
EX-OR and EX-NOR Gates - Worksheet 2		✓	
EX-OR and EX-NOR Gates - Worksheet 3		✓	
EX-OR and EX-NOR Gates - Worksheet 4		✓	

Cont.

Topic/Lesson	P	I/P	R
Sequential Logic			
Characteristics of a NAND Gate S-R Latch - Exercise 1.1		✓	
Characteristics of an S-R Latch IC - Exercise 1.2		✓	✓
The S-R Latch - Worksheet 1		✓	
The S-R Latch - Worksheet 2		✓	
The S-R Latch - Worksheet 3		✓	
The S-R Latch - Worksheet 4		✓	
Characteristics of a D-Type Flip-Flop - Exercise 2.1		✓	
Characteristics of a D-Type with D Connected to Q - Exercise 2.2		✓	✓
The D-Type Flip-Flop - Worksheet 5		✓	
The D-Type Flip-Flop - Worksheet 6		✓	
The D-Type Flip-Flop - Worksheet 7		✓	
The D-Type Flip-Flop - Worksheet 8		✓	
Characteristics of a J-K Flip-Flop - Exercise 3.1		✓	
Characteristics of a J-K Flip-Flop Connected as a D-Type - Exercise 3.2		✓	
Characteristics of a J-K Flip-Flop Connected as a T-Type - Exercise 3.3		✓	✓
The J-K Flip-Flop - Worksheet 9		✓	
The J-K Flip-Flop - Worksheet 10		✓	
Characteristics of a D-Type 2-bit Shift Register - Exercise 4.1		✓	
Characteristics of a J-K 4-bit Shift Register - Exercise 4.2		✓	✓
Binary Counters - Exercise 5.1		✓	
Characteristics of a J-K 4-bit Binary Counter - Exercise 5.2		✓	
Characteristics of a Binary Up Counter with Reduced Count - Exercise 5.3		✓	
Characteristics of a Binary Up Counter with Reduced Count 2 - Exercise 5.4		✓	✓
Binary Counters - Worksheet 11		✓	
Binary Counters - Worksheet 12		✓	
Interfacing			
TTL Logic Gate Input and Output Characteristics - Exercise 5.1		✓	
TTL Input and Output Characteristics - Exercise 8.1		✓	
CMOS Input and Output Characteristics - Exercise 8.2		✓	✓



24 Digital Electronics (D3000 Practice) Cont.

Topic/Lesson	P	I/P	R
Digital Systems			
Characteristics of a 4-2 Line Encoder Circuit - Exercise 2.1		✓	
Characteristics of a 2-4 Line Decoder Circuit - Exercise 2.2		✓	✓
Encoder and Decoder Circuits - Worksheet 5		✓	
Encoder and Decoder Circuits - Worksheet 6		✓	
Encoder and Decoder Circuits - Worksheet 7		✓	
Characteristics of a 4-input Multiplexer Circuit - Exercise 3.1		✓	
Characteristics of a 1 to 1-of-4-line Demultiplexer Circuit - Exercise 3.2		✓	
Characteristics of a Multiplexer/Demultiplexer Circuit - Exercise 3.3		✓	✓
Multiplexer and Demultiplexer Circuits - Worksheet 8		✓	
Multiplexer and Demultiplexer Circuits - Worksheet 9		✓	
Characteristics of a 4-input Priority Encoder Circuit - Exercise 4.1		✓	✓
Priority Encoder Circuits - Worksheet 10		✓	
Priority Encoder Circuits - Worksheet 11		✓	
2-bit Equal-Input Magnitude Comparator Circuit - Exercise 5.1		✓	
Characteristics of a Single-Bit Magnitude Comparator Circuit - Exercise 5.2		✓	
Characteristics of a 4-bit Magnitude Comparator IC - Exercise 5.3		✓	
Determination of a 4-Bit Code Using a Magnitude Comparator - Exercise 5.4		✓	✓
Magnitude Comparator Circuits - Worksheet 12		✓	
Full Adder Circuits - Exercise 6.1		✓	
Full Adder Circuits - Exercise 6.2		✓	✓
Full Adder Circuits - Worksheet 13		✓	
Characteristics of a Three State Logic Circuit - Exercise 7.1		✓	
Characteristics of a 2-1 Multiplexer Using Three State Logic - Exercise 7.2		✓	
Characteristics of a Three State Logic Bi-Directional Switch - Exercise 7.3		✓	✓
Three State Logic Circuits - Worksheet 14		✓	
Characteristics of an Analog Switch IC (211) - Exercise 1.1		✓	
Characteristics of an S - R Latch IC (74LS00) - Exercise 1.2		✓	
Characteristics of an Astable IC (4047) - Exercise 1.3		✓	
Characteristics of a Monostable IC (74LS123) - Exercise 1.4		✓	
Characteristics of an Analog Switch, S - R Bistable System - Exercise 1.5		✓	✓

Cont.

Topic/Lesson	P	I/P	R
The Analog Switch and Multivibrator IC Circuits - Worksheet 1		✓	
The Analog Switch and Multivibrator IC Circuits - Worksheet 2		✓	
The Analog Switch and Multivibrator IC Circuits - Worksheet 3		✓	
The Analog Switch and Multivibrator IC Circuits - Worksheet 4		✓	
The Analog Switch and Multivibrator IC Circuits - Worksheet 5		✓	
Binary/BCD Counters and 7-Segment Decoder/Driver/Displays - Exercise 2.1		✓	
BCD UP/DOWN Counters and 7-Segment Decoder/Driver/Displays - Exercise 2.2		✓	
Binary/BCD Counters, and 7-Segment Decoder/Driver/Displays - Worksheet 6		✓	
Binary/BCD Counters, and 7-Segment Decoder/Driver/Displays - Worksheet 7		✓	
Binary/BCD Counters, and 7-Segment Decoder/Driver/Displays - Worksheet 8		✓	
Binary/BCD Counters, and 7-Segment Decoder/Driver/Displays - Worksheet 9		✓	
Characteristics of an Analog Comparator IC (311) - Exercise 3.1		✓	
Characteristics of an Analog Integrator IC (3140) - Exercise 3.2		✓	
Triangular Waveform Generation - Exercise 3.3		✓	✓
Signal Converters - Exercise 4.1		✓	
Characteristics of an Incremental A-D Converter System - Exercise 4.2		✓	✓
Waveform Generator and Digital Voltmeter Systems - Exercise 5.1		✓	
Characteristics of a Frequency Counter System - Exercise 5.2		✓	
Characteristics of a Timer/Counter System - Exercise 5.3		✓	
Characteristics of a Triangular Waveform Generator System - Exercise 5.4		✓	✓
The Analog Comparator and Analog Integrator - Worksheet 10		✓	
D-A Converter IC and an A-D Converter Circuit - Worksheet 11		✓	
Fault Diagnosis - Triangle Waveform Generator Circuit - Worksheet 12		✓	



25 Electronic Systems (Series 9 Practice)

Topic/Lesson	P	I/P	R
Components			
Light Dependent Resistor - LDR		✓	
Thermistor		✓	
Applying Power to a Device		✓	
Output Driver		✓	
Relay		✓	
DC Operated Buzzer		✓	
Amplifier and Loudspeaker		✓	
Seven Segment Display (Digital Signals)		✓	
Logic Source Switches		✓	
Logic Gates		✓	
Threshold Detector (Comparator)		✓	
Voltage Amplifier		✓	

Cont.

Topic/Lesson	P	I/P	R
Signal Processing			
Automatic Light Switch System		✓	
Fire Detector (Sprinkler) System		✓	
Switch State Detector System		✓	
Latching Switch System		✓	
Voltage Divider		✓	
Creating a Reference Voltage		✓	
Sensor Voltage Divider		✓	
Analog Signals		✓	
Digital Signals		✓	
Combined Analog/Digital Signals		✓	
Lighting/Temperature Failure Warning System		✓	
Thermostat with Time Switch Controller		✓	



26 Electronic Principles (Series 9 Practice)

Topic/Lesson	P	I/P	R
DC Circuits			
Voltage - Adjustment and Measurement		✓	
Measuring Current		✓	
Resistance		✓	
Ohm's Law		✓	
Power		✓	
Other Ways to Calculate Power		✓	
Resistor Measurements		✓	
Troubleshooting Resistors		✓	
The Series Circuit		✓	
The Parallel Circuit		✓	
Series-Parallel Combinations		✓	
Kirchhoff's Voltage Law		✓	
Kirchhoff's Current Law		✓	
Troubleshooting Resistor Networks		✓	
The Rheostat		✓	
The Potentiometer		✓	
Charging and Discharging a Capacitor		✓	
Capacitor Charge Time		✓	
Capacitor on a DC Supply		✓	
Time Constant		✓	
CR Integrator		✓	
Troubleshooting a CR Integrator Circuit		✓	
Kirchhoff's Voltage Law		✓	
Kirchhoff's Current Law		✓	
Investigation of a Wheatstone Bridge		✓	

Cont.

Topic/Lesson	P	I/P	R
AC Circuits			
Voltage and Current		✓	
Alternating Current - AC		✓	
Alternating Voltage Values		✓	
Capacitor on an AC Supply		✓	
Troubleshooting an AC Supply Capacitor Circuit		✓	
Capacitors with AC Applied		✓	
Capacitors in Series		✓	
Capacitors in Parallel		✓	
Troubleshooting a Parallel Capacitor Network		✓	
The Reservoir Capacitor		✓	
Inductors with AC Applied		✓	
Plotting Frequency Responses of RC and RL Circuits		✓	
The Parallel Tuned Circuit		✓	
Magnetism and Electromagnetism			
Attraction and Repulsion		✓	
Other Magnetic Materials		✓	
The Magnetic Field		✓	
Electromagnet Field Plot		✓	
The Magnetizing Effect on Different Core Materials		✓	
Electromagnetic Induction		✓	
The Solenoid		✓	
Investigation of a Basic Transformer		✓	
The Tapped Transformer		✓	
Troubleshooting the Transformer		✓	
The DC Motor		✓	
The DC Generator		✓	
Troubleshooting the DC Motor		✓	
The Relay		✓	
Investigating Change-Over and Latching Circuits		✓	
Troubleshooting the Relay-1		✓	
Troubleshooting the Relay-2		✓	



27 Linear Electronics (Series 9 Practice)

Topic/Lesson	P	I/P	R
Operational Amplifier Circuits			
Zero-Crossing Detector		✓	
Comparator		✓	
Feedback Amplifier		✓	
Variation of Gain		✓	
The Inverting AC Amplifier		✓	
Troubleshooting an Inverting Amplifier		✓	
Non-Inverting Amplifier		✓	
The Non-Inverting AC Amplifier		✓	
Unity Gain Amplifier - Voltage Follower		✓	
Unity Gain Amplifier		✓	
Summing Amplifier		✓	
Troubleshooting Summing Amplifiers		✓	
Regenerative Comparator Under DC Conditions		✓	
Regenerative Comparator Under AC Conditions		✓	
AC Comparator		✓	
Investigation of an Integrator		✓	
The AC Performance of an Inverting Amplifier		✓	
The Frequency Performance of an Inverting Amplifier		✓	
The AC Performance of a Non-Inverting Amplifier		✓	
The Frequency Performance of a Non-Inverting Amplifier		✓	
The High Frequency Performance of an Operational Amplifier		✓	
Gain-Bandwidth Product in Practice		✓	
Slew Rate Limitation of an Amplifier		✓	
Troubleshooting Amplifiers		✓	

Cont.

Topic/Lesson	P	I/P	R
Current Amplifier Circuits			
The Need for Power Amplification		✓	
Operation of a Current Amplifier		✓	
The Operation of a Push-pull Amplifier		✓	
Improving the performance of Push-pull Amplifier (1)		✓	
Improving the performance of Push-pull Amplifier (2)		✓	
Measuring Power in Single-ended and Push-pull Amplifiers		✓	
Troubleshooting Amplifiers		✓	



28 Semiconductors (Series 9 Practice)

Topic/Lesson	P	I/P	R
Diodes			
The PN Junction Diode		✓	
Testing a Diode		✓	
Troubleshooting Diode Circuits		✓	
Half-Wave Rectifier		✓	
Troubleshooting Rectifier Circuits		✓	
The Zener Diode		✓	
Transistors			
The Bipolar (Junction) Transistor - BJT		✓	
Current Gain Characteristic		✓	
Output Characteristic		✓	
Transistor as a Switch		✓	
NPN Transistor Switch		✓	
Troubleshooting a Single Transistor Switch Circuit		✓	
PNP Transistor Switch		✓	
Regenerative NPN/PNP Switch		✓	
Darlington Pair Switch Circuit		✓	
Troubleshooting a Darlington Pair Switch Circuit		✓	
Investigation of an N-channel JFET		✓	
The Analog Switch		✓	

Cont.

Topic/Lesson	P	I/P	R
Transistor Amplifiers			
Voltage Amplifier with DC Applied		✓	
Voltage Amplifier with Alternating Input		✓	
Simple Current Biasing		✓	
Voltage Divider Biasing		✓	
Emitter Decoupling Capacitor		✓	
Troubleshooting a Common Emitter Amplifier		✓	
Common Collector Amplifier - Emitter Follower		✓	
Measurement of Quiescent Voltages		✓	
Investigation of the Amplifier with an Applied Signal		✓	
Loading a Voltage Divider		✓	
Emitter Follower Circuits		✓	
Troubleshooting a Darlington Pair Emitter Follower		✓	
The Basic NPN/PNP Complementary Pair		✓	
Elimination of Crossover Distortion		✓	
Differential Amplifier Under DC Conditions		✓	
Differential Amplifier Under AC Conditions		✓	
JFET Common Source Amplifier Investigation		✓	
SCRs			
Silicon Controlled Rectifier - SCR		✓	
Capacitor Commutation		✓	
DC Control of an SCR with AC Applied		✓	
CR Phase Shift Control Circuit		✓	
Uni-Junction Transistor - UJT		✓	
UJT Phasing Pulse Generator		✓	
Troubleshooting an AC Phase Control Circuit		✓	



29 Digital Electronics (Series 9 Practice)

Topic/Lesson	P	I/P	R
Number Systems			
Practical Investigation of Number Systems		✓	
Combinational Logic			
The NOT Gate (D3000 - 9.1)		✓	
The NOT Gate (D3000 - 9.2)		✓	
The AND Gate (D3000 - 9.1)		✓	
The AND Gate (D3000 - 9.2)		✓	
The OR Gate (D3000 - 9.1)		✓	
The OR Gate (D3000 - 9.2)		✓	
The NAND Gate (D3000 - 9.1)		✓	
The NAND Gate (D3000 - 9.2)		✓	
The NOR Gate (D3000 - 9.1)		✓	
The NOR Gate (D3000 - 9.2)		✓	
Boolean Expressions From Logic Circuits		✓	
NOT Gate From a NAND Gate		✓	
AND Gate From NAND Gates		✓	
OR Gate From NAND Gates		✓	
NOR Gate From NAND Gates		✓	
The Exclusive-OR Gate (D3000 - 9.1)		✓	
The Exclusive-OR Gate (D3000 - 9.2)		✓	
The Exclusive-NOR Gate (D3000 - 9.1)		✓	
The Exclusive-NOR Gate (D3000 - 9.2)		✓	
Troubleshooting The Exclusive-NOR Gate		✓	
Operation of the Schmitt NOT Gate		✓	
Logic Gate Switches		✓	
Combinational Logic Circuits		✓	
Diode Logic		✓	
Diode Transistor Logic (DTL)		✓	

Cont.

Topic/Lesson	P	I/P	R
Sequential Logic			
The S-R Latch Constructed From NOR Gates (D3000 - 9.1)		✓	
The S-R Latch Constructed From NOR Gates (D3000 - 9.2)		✓	
The S-R Latch Constructed From NAND Gates (D3000 - 9.1)		✓	
The S-R Latch Constructed From NAND Gates (D3000 - 9.2)		✓	
Troubleshooting The S-R Latch (Function #2)		✓	
The J-K Flip-Flop		✓	
D-Type (Data) Flip-Flop		✓	
T-Type (Toggling) Flip-Flop		✓	
Shift Registers		✓	
3-Bit Up-Counter		✓	
3-Bit Down-Counter		✓	
Binary Counter IC		✓	
Modulo-N Counter		✓	
Digital Systems			
2-4 Line Decoder		✓	
4-2 Line Encoder		✓	
Encoder-Decoder Circuit		✓	
1-4 Line Demultiplexer		✓	
4-1 Line Multiplexer		✓	
Multiplexer-Demultiplexer Circuit		✓	
4-Bit Magnitude Comparator		✓	
Half Adder		✓	
Full Adder		✓	
4-Bit Binary Full Adder		✓	
Three-State (Tri-State) Buffer		✓	
2-1 Multiplexer		✓	
Bi-Directional Switch		✓	
BCD Counter and 7-Segment Decoder		✓	
Seven-Segment Display		✓	
Analog Switch		✓	
Astable IC Circuit		✓	
Monostable IC Circuit		✓	
Digital to Analog Converter		✓	
Analog to Digital Converter		✓	



30 Microprocessors (Series 9 Practice)

Topic/Lesson	P	I/P	R
The PIC Microcontroller			
Introduction to PICs		✓	
Features of a PIC		✓	
The PIC Development System			
Introduction to the PIC Basic Software		✓	
Introduction to the PICShell Software		✓	
Introduction to the Software and Hardware		✓	

Cont.

Topic/Lesson	P	I/P	R
Developing PIC Programs			
Defining Device Type and Clock Speed		✓	
Programming Fundamentals		✓	
The PIC Ports		✓	
Writing programs to use the Ports		✓	
Loops and Conditional Branching		✓	
Using Loops and Conditional Branching		✓	
Arithmetic and Logic Operations		✓	
Creating Delays		✓	
Using Arithmetic and Logic Operations		✓	
Introduction to Interrupts		✓	
Commands to set up an Interrupt on Portb		✓	
Using an Interrupt on Portb		✓	



31 Engine Repair

Topic/Lesson	P	I/P	R
Engine Fundamentals			
Introduction to Engine Systems	✓	✓	✓
Four Stroke Cycle (auto rig)		✓	✓
Position and Mounting of Engine Components (rig)		✓	✓
Front End Component Identification (auto rig)		✓	✓
Common Rail Diesel Engine Operation (auto rig)		✓	✓
Common Rail Diesel Engine Component Identification (auto rig)		✓	✓
Sectioned (CI) Engine Component Identification (rig)		✓	✓
Cylinder Head and Valve Trains			
Components of the Top End	✓	✓	✓
Top End Component Identification (auto rig)		✓	✓
Engine Cycles, Valve and Ignition Timing	✓	✓	✓
Camshafts and Valve Lifters	✓	✓	✓
Valve Trains	✓	✓	✓
Engine Block			
Components of the Bottom End	✓	✓	✓
Bottom End Component Identification (auto rig)		✓	✓
Engine Blocks and Liners	✓	✓	✓
CI Engine Size (rig)		✓	✓
Pressure and Volume	✓	✓	✓
Engine Size (auto rig)		✓	✓
Pistons	✓	✓	✓
Crankshaft and Piston Operation (rig)		✓	✓
Engine Servicing			
Basic Engine Service Procedures (workshop)		✓	
Inspect and Repair Threads (workshop)		✓	
Engine Removal and Replacement (workshop)		✓	
Cooling System Inspection, Test and Repair (workshop)		✓	
Manifold Vacuum Test (workshop)		✓	
Cylinder Compression Test (workshop)		✓	
Cylinder Power Balance Test (workshop)		✓	
Cylinder Leakage Test (workshop)		✓	
Adjustment of Valve Clearances on an OHC Engine (workshop)		✓	
Camshaft Timing Verification (workshop)		✓	
The Crankshaft Sensor (workshop)		✓	

Cont.

Topic/Lesson	P	I/P	R
Lubrication and Cooling Systems			
Lubrication Systems	✓	✓	✓
Engine Oil Pressure		✓	✓
Engine Oil Pressure (board)		✓	✓
Engine Oil Pressure (panel)		✓	
Lubrication System Inspection (workshop)		✓	
Cooling Systems	✓	✓	✓
Vehicle Cooling System Inspection (workshop)		✓	
Adjusting Drive Belt Tension (workshop)		✓	✓



32 Automatic Transmission and Transaxle

Topic/Lesson	P	I/P	R
Transmission System Fundamentals			
Introduction to Automatic Transmissions	✓	✓	✓
Automatic Transmission Systems	✓	✓	✓
Automatic Transmission Operation (auto rig)		✓	✓
Automatic Transmission Components			
Torque Converter	✓	✓	✓
Torque Converter (auto rig)		✓	✓
Planetary Gears, Clutches, and Bands	✓	✓	✓
Gears and Planetary Gear Sets	✓		✓
Automatic Transmission Gears (auto rig)		✓	✓
Electrical and Electronic Controls	✓	✓	✓
Final Drives			
Drivetrain and Driveline	✓	✓	✓
Locating Driveline Components (workshop)		✓	✓
Front Wheel Final Drive Systems	✓	✓	✓
Rear Wheel Final Drive Systems	✓	✓	✓
Automatic Transmission Servicing			
Automatic Transmission Diagnostic Checks (workshop)		✓	

33 Manual Drive Train and Axles

Topic/Lesson	P	I/P	R
Manual Transmission System Fundamentals			
Manual Transmission Introduction	✓	✓	✓
Manual Transmissions	✓	✓	✓
Clutch and Manual Transmission Systems	✓	✓	✓
Gears and Gear Ratios (auto rig)		✓	✓
Manual Transmission Components and Operation			
Manual Transmission Construction (auto rig)		✓	✓
Transmission Operation (auto rig)		✓	✓
Clutch Construction and Operation	✓	✓	✓
Clutch Design	✓	✓	✓
Gears and Speed		✓	✓
Gears and Speed (panel)		✓	
Gears and Speed (board)		✓	✓
Manual Transaxles	✓	✓	✓
Differential (rig)		✓	✓
Front Wheel Drive Shafts	✓	✓	✓
Selector Lever and Selector Forks (rig)		✓	✓
Rear Wheel Drive Shafts	✓	✓	✓
Manual Transmission and Driveline Servicing			
Clutch Removal, Inspection, and Refitting	✓	✓	✓
Clutch System - Symptoms and Faults	✓	✓	✓
Drive Shaft Servicing Procedures (workshop)		✓	
Inspecting FWD Shafts and Joints (workshop)		✓	✓
Inspecting the Complete Transmission System of a Vehicle (workshop)		✓	

**34 Suspension**

Topic/Lesson	P	I/P	R
Suspension System Fundamentals			
Suspension Systems 1	✓	✓	✓
Suspension Systems 2	✓	✓	✓
Geometry Fundamentals	✓	✓	✓
Suspension Components and Operation			
Control Arms	✓	✓	✓
Springs and Shock Absorbers	✓	✓	✓
Coil Springs	✓	✓	✓
Torsion Bars	✓	✓	✓
Leaf and Rubber Springs	✓	✓	✓
MacPherson Struts	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Inspection and Repair			
Geometry Adjustments	✓	✓	✓
Remove, Inspect, and Install Transverse Links and Strut Rods (workshop)		✓	
Remove, Inspect, and Install Upper and Lower Control Arms (workshop)		✓	
Remove, Inspect and Install Ball Joints on Suspension Systems (workshop)		✓	
Removal, Inspection and Installation of Coils Springs and Insulators (workshop)		✓	
How to Check Shock Absorbers for Leaks (auto rig)		✓	✓
Inspect, Remove, and Replace Shock Absorbers (workshop)		✓	
MacPherson Strut Coil Spring Removal and Inspection (auto rig)		✓	✓
MacPherson Strut Removal, Inspection & Reinstallation Procedures (workshop)		✓	
Remove, Inspect, Install and Adjust Torsion Bars (workshop)		✓	
Remove, Inspect and Install Stabilizer Bushings, Brackets and Links (workshop)		✓	
Remove, Inspect, Install, and Adjust Strut Rods and Bushings (workshop)		✓	
Leaf Spring Removal, Inspection, and Reinstallation Procedures (workshop)		✓	



35 Steering

Topic/Lesson	P	I/P	R
Steering System Components and Operation			
Steering Systems	✓	✓	✓
Conventional Steering System Components	✓	✓	✓
Steering Rack	✓	✓	✓
The Steering Column	✓		✓
Tie Rods	✓	✓	✓
Power Steering Systems	✓	✓	✓
Electronic Steering Systems	✓	✓	✓
Introduction to the Steering and Suspension Trainer (auto rig)		✓	✓
Using the Power Steering on the Steering and Suspension Trainer (auto rig)		✓	✓
Inspection and Repair			
Adjusting Wheel Height (auto rig)		✓	✓
Steering Column Inspection (auto rig)		✓	✓
Steering Column Inspection (workshop)		✓	
Steering Column Fault Diagnosis (workshop)		✓	
Steering Wheel Adjustment (auto rig)		✓	✓
Check Power Steering System (workshop)		✓	
Check and Top-Up Power Steering Fluid (auto rig)		✓	✓
Flushing and Bleeding the Power Steering System (auto rig)		✓	✓
Remove and Inspect Conventional Steering Components (workshop)		✓	✓
Remove, Inspect, and Replace Conventional Steering Components (workshop)		✓	
Adjustment of Steering Box Pre-Load (workshop)		✓	
Tie Rod Removal and Adjustment (auto rig)		✓	✓
Steering Knuckle Removal and Inspection (auto rig)		✓	✓
Rack and Pinion Gear Service (workshop)		✓	
Removing Rack and Pinion Steering Gear (auto rig)		✓	✓
Diagnose Power Steering Problems (workshop)		✓	
Check Front Cradle (Subframe) Alignment (workshop)		✓	
Working on Electronically Controlled Suspension & Steering System (workshop)		✓	

Cont.

Topic/Lesson	P	I/P	R
Wheels and Tires			
Wheel and Tire Fundamentals	✓	✓	✓
Road Wheels	✓	✓	✓
Tires	✓	✓	✓
Tire Wear and Rotation	✓	✓	✓
Tire Inspection and Repair	✓	✓	✓
Wheel and Tire Diagnosis	✓	✓	✓
Tire Changing and Wheel Balancing	✓	✓	✓
Wheel Balancing Principles	✓	✓	✓
Wheel and Tire Runout	✓	✓	✓
Wheel Alignment	✓	✓	✓
Wheel Bearings	✓	✓	✓
Wheel and Tire Servicing			
Tire Inspection and Inflation (workshop)		✓	✓
Tire Inspection (workshop)		✓	
Road Wheel Removal and Installation (workshop)		✓	✓
Road Wheel Removal and Installation (workshop)		✓	
Tire Rotation (workshop)		✓	
Perform Prealignment Inspection (workshop)		✓	
Ride Height Measurement (workshop)		✓	
Caster, Camber, Toe, and Setback Checks and Adjustment (workshop)		✓	
Check Steering Axis Inclination and Toe-out on Turns (workshop)		✓	
Wheel Alignment Checks (workshop)		✓	
Measure Wheel, Tire, Axle and Hub Runout (workshop)		✓	
Balance Wheel and Tire Assembly (workshop)		✓	
Tire Repair Workshop Procedure (workshop)		✓	
Wheel Bearing Maintenance (workshop)		✓	
Wheel Bearing Replacement Procedure (workshop)		✓	
Sealed Wheel Bearing Replacement Procedure (workshop)		✓	
Wheel Stud Replacement Procedure (workshop)		✓	



36 Brake Systems

Topic/Lesson	P	I/P	R
Brake System Fundamentals			
Brake Systems 1	✓	✓	✓
Brake Systems 2	✓	✓	✓
Friction	✓	✓	✓
Hydraulic Control			
Fluid Power Concepts	✓	✓	✓
Basic Fluid Power Engineering	✓	✓	✓
Warning Systems			
Brake Warning Systems	✓	✓	✓
Brake Fluid Warning System		✓	
Brake Fluid Warning System (board)		✓	✓
Brake Fluid Warning System (panel)		✓	✓
Anti-lock Braking Systems			
Anti-Lock Brake Systems	✓	✓	✓
Anti-Lock Brake Trainer (panel)		✓	✓
ABS Braking Cycle (panel)		✓	✓
Wheel Speed Sensors	✓	✓	✓
Inductive Sensor Investigation (panel)		✓	✓
Hall Effect Sensor Investigation (panel)		✓	✓
Troubleshooting ABS Input Devices 1 (panel)		✓	✓
Troubleshooting ABS Input Devices 2 (panel)		✓	✓
Troubleshooting ABS Input Devices 3 (panel)		✓	✓
Sensors and Switches	✓	✓	✓
Brake Pedal Travel Sensor (panel)		✓	✓
Troubleshooting ABS Input Devices 4 (panel)		✓	✓
Brake Fluid Level Switch (panel)		✓	✓
Troubleshooting ABS Input Devices 5 (panel)		✓	✓
Hydraulic Pump Motor Speed Sensor (panel)		✓	✓
Troubleshooting ABS Input Devices 6 (panel)		✓	✓
Brake Pedal Switch (panel)		✓	✓
ABS ECU Circuits and Signals	✓	✓	✓
ABS Relay (panel)		✓	✓
ABS Warning Lamp and Diode (panel)		✓	✓
Troubleshooting ABS Output Devices 1 (panel)		✓	✓
Troubleshooting ABS Output Devices 2 (panel)		✓	✓
Troubleshooting ABS Output Devices 3 (panel)		✓	✓
Troubleshooting ABS Output Devices 4 (panel)		✓	✓

Cont.

Topic/Lesson	P	I/P	R
Troubleshooting ABS Output Devices 5 (panel)		✓	✓
Troubleshooting ABS Output Devices 6 (panel)		✓	✓
Hydraulic Control Unit (panel)		✓	✓
Hydraulic Pump and Motor (panel)		✓	✓
Advanced Brake Systems			
Electronic Brake Systems Introduction	✓	✓	✓
Stability Control Systems	✓	✓	✓
Stability Control Electronics and Hydraulics	✓	✓	✓
Diagnosing Faults in ESP Systems	✓	✓	✓

37 Brake Components

Topic/Lesson	P	I/P	R
Brake System Fundamentals			
Introduction to the Brake Systems Trainer (auto rig)		✓	✓
Drum Brakes			
Brake Drums	✓	✓	✓
Brake Shoes	✓	✓	✓
Parking Brakes	✓	✓	✓
Wheel Cylinders	✓	✓	✓
Disc Brakes			
Brake Rotors	✓	✓	✓
Brake Calipers	✓	✓	✓
Brake Pads	✓	✓	✓
Integral Caliper Parking Brake	✓	✓	✓
Hydraulic Control			
Hydraulics	✓	✓	✓
Basic Control Valves	✓	✓	✓
Pressure Control Valves	✓	✓	✓
The Master Cylinder	✓	✓	✓
Brake Lines and Hoses	✓	✓	✓
Brake Fluid	✓	✓	✓
Power Assistance			
Vacuum Brake Boosters	✓	✓	✓
Hydraulic Brake Boosters	✓	✓	✓



38 Brake Servicing

Topic/Lesson	P	I/P	R
Brake System Fundamentals			
Braking Forces	✓	✓	✓
Braking Calculations	✓	✓	✓
Drum Brake System Servicing			
Drum Brake Removal and Inspection (auto rig)		✓	✓
Drum Brake Removal, Disassembly and Inspection (auto rig)		✓	✓
Brake Shoe Replacement (auto rig)		✓	✓
Wheel Cylinder Removal and Inspection (workshop)		✓	✓
Adjusting the Parking Brake (auto rig)		✓	✓
Machining a Drum (workshop)		✓	
Disc Brake System Servicing			
Brake Caliper Inspection (auto rig)		✓	✓
Brake Pad Removal and Brake Assembly Inspection (auto rig)		✓	✓
Brake Pad Replacement (auto rig)		✓	✓
Brake Rotor Replacement (auto rig)		✓	✓
Measuring Brake Rotors (auto rig)		✓	✓
Brake Pad Wear Indicator Inspection		✓	✓
Integral Caliper Parking Brake Service (workshop)		✓	
Machining a Rotor (workshop)		✓	
Brake Line Servicing			
Brake Line Inspection (workshop)		✓	✓
Brake Line Inspection (workshop)		✓	
Brake Line Fabrication (workshop)		✓	✓
Fabricating Brake Lines (workshop)		✓	

Cont.

Topic/Lesson	P	I/P	R
Brake System Servicing			
Brake Pedal Height	✓	✓	✓
Checking Pedal Heights and Adjusting Push Rod Length (workshop)		✓	
Bleed Brake System (Manual Bleed) (workshop)		✓	
Parking Brake Cable Replacement (auto rig)		✓	✓
Master Cylinder Inspection (workshop)		✓	
Master Cylinder Removal, Bench Bleed, and Reinstall (workshop)		✓	
Flush Brake System (workshop)		✓	
Bleeding a Pressurized Anti-lock Braking System (workshop)		✓	
Test Vacuum Brake Booster Procedure (workshop)		✓	
Vacuum Leak Testing Procedure (workshop)		✓	
Vacuum Supply Testing Procedure (workshop)		✓	
Vacuum Supply Testing Procedure (workshop)		✓	✓
ABS Servicing Procedure (workshop)		✓	
De-pressurize High-pressure Components of the ABS System (workshop)		✓	
Replacing ABS Component Procedure (workshop)		✓	
Testing the Anti-lock Braking System (workshop)		✓	
Troubleshooting a Braking System (workshop)		✓	
Testing the Brake Lamp Switch Circuit (workshop)		✓	✓
Test Brake Light Switch (workshop)		✓	



39 Automotive Electrical Fundamentals

Topic/Lesson	P	I/P	R
Electrical Fundamentals			
Simple Circuits	✓	✓	✓
Simple Battery and Lamp Circuit (board)		✓	✓
Controlling and Protecting Simple Circuits	✓	✓	✓
Simple Battery, Lamp, and Switch Circuit (board)		✓	✓
Simple Battery, Lamp, Switch and Fuse Circuit (board)		✓	✓
Common Ground Circuits and Wiring Diagrams	✓	✓	✓
Common Ground Circuits (board)		✓	✓
Wiring Diagrams (board)		✓	✓
DC and AC Current	✓	✓	✓
Current Flow in a Simple Circuit (board)		✓	✓
Power	✓	✓	✓
Continuity and Circuit Faults	✓	✓	✓
Continuity (board)		✓	✓
Circuit Faults (board)		✓	✓
Pushbutton Switches and Switch Circuits	✓	✓	✓
Pushbutton Switches (board)		✓	✓
Switches in Series and Parallel (board)		✓	✓
Changeover Switches	✓	✓	✓
Two-Position Changeover Switches (board)		✓	✓
Two-Position, Two-Pole Changeover Switches (board)		✓	✓
Resistance and Ohm's Law	✓	✓	✓
Ohm's Law (board)		✓	✓
Resistance (board)		✓	✓
Electricity	✓	✓	✓
Electrical Circuits	✓	✓	✓
Electromagnetic Principles	✓	✓	✓
Electrical Safety and Circuit Checks	✓	✓	✓
Introduction to Wiring Diagrams	✓	✓	✓
Control Principles	✓	✓	✓
Control Examples	✓	✓	✓
Information Flow	✓	✓	✓
Physical Environment to Electrical Transformation	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Electrical Components and Operation			
Capacitor Types and Applications	✓	✓	✓
Diode Types and Applications	✓	✓	✓
Transistors	✓	✓	✓
Relays	✓	✓	✓
The Relay (board)		✓	✓
Signal Processing	✓	✓	✓
Sensors	✓	✓	✓
Types of Control Signals	✓	✓	✓
Electrical Supply			
Batteries	✓	✓	✓
Battery and Fuse Investigation (board)		✓	✓
Battery and Fuse Investigation (panel)		✓	✓
Battery and Fuse Circuit Fault Investigation 1 (board)		✓	✓
Battery and Fuse Circuit Fault Investigation 1 (panel)		✓	✓
Battery and Fuse Circuit Fault Investigation 2 (board)		✓	✓
Battery and Fuse Circuit Fault Investigation 2 (panel)		✓	✓
Electrical Measurement			
Electrical Test Equipment	✓	✓	✓
Using a Multimeter	✓	✓	✓
Voltage, Resistance, and Continuity (board)		✓	✓
Measuring Current	✓	✓	✓
Reading Wiring Diagrams	✓	✓	✓
Voltage Drop	✓	✓	✓
Calculating and Adjusting Permitted Voltage Drop	✓	✓	✓
Electrical Circuit Testing (workshop)		✓	✓
Symbols, Device Markings and Terminal Block Designations	✓	✓	✓



40 Automotive Starting and Charging

Topic/Lesson	P	I/P	R
Starting System Fundamentals			
Starting Systems	✓	✓	✓
Starting and Charging		✓	✓
Starting and Charging (panel)		✓	
Starting and Charging (board)		✓	✓
Starting System Inspection and Test			
Starter Motor and Solenoid Measurements (board)		✓	✓
Starter Motor and Solenoid Measurements (panel)		✓	✓
Starter Control Circuit Service (workshop)		✓	
Performing Voltage Drop and Current Draw Tests (workshop)		✓	
Starter Relay & Solenoid Testing, Starter Motor Replacement (workshop)		✓	
Starting System Fault Diagnosis	✓	✓	✓
Starting System Problems (board)		✓	✓
Starting System Problems (panel)		✓	✓
Wire Repair (workshop)		✓	

Cont.

Topic/Lesson	P	I/P	R
Charging System Fundamentals			
Charging Principles	✓	✓	✓
Magnetism and Electromagnetism	✓	✓	✓
Charging Systems	✓	✓	✓
Alternator Construction	✓	✓	✓
Work of the Regulator	✓	✓	✓
Charging System Inspection and Test			
Alternator Output Tests	✓	✓	✓
Alternator Output Tests (workshop)		✓	
Alternator Output Waveforms (board)		✓	✓
Alternator Output Waveforms (panel)		✓	✓
Charging System Fault Diagnosis	✓	✓	✓
Alternator Fault Investigation 1 (board)		✓	
Alternator Fault Investigation 1 (panel)		✓	✓
Alternator Fault Investigation 2 (board)		✓	✓
Alternator Fault Investigation 2 (panel)		✓	✓
Alternator Service Procedure (workshop)		✓	
Replacing an Alternator and Drive Belt (workshop)		✓	



41 Automotive Lighting

Topic/Lesson	P	I/P	R
Lighting Circuit Fundamentals			
Types of Light Sources	✓	✓	✓
Lighting Systems		✓	✓
Lighting Systems (board)		✓	✓
Lighting Systems (panel)		✓	
Series Lamp Circuits	✓	✓	✓
Identical Lamps in Series (board)		✓	✓
Non-Identical Lamps in Series (board)		✓	✓
Parallel Lamp Circuits	✓	✓	✓
Identical Lamps in Parallel (board)		✓	✓
Identical Lamps in Parallel (board) [700-10]		✓	
Power in a Simple Lamp Circuit (board)		✓	✓
Three-Position Changeover Switches (board)		✓	✓
Non-Identical Lamps in Parallel (board)		✓	✓
Headlight Circuits			
Headlamps 1	✓	✓	✓
Headlamps	✓	✓	
Headlamps 2		✓	✓
Headlights (board)		✓	✓
Headlights (panel)		✓	✓
Low and High Beam Circuits (board)		✓	✓
Headlamp Flash Circuit	✓	✓	✓
High Beam Flash Circuit (board)		✓	✓
Three-Pin Relay Headlamp Circuit (board)		✓	✓
Four-Pin Relay Headlamp Circuit (board)		✓	✓
Relay and Spot Lamp Circuit (board)		✓	✓
Automatic Lighting	✓	✓	✓
Automatic Lighting (board)		✓	
Park and Tail Light Circuits			
Park and Tail Lighting	✓	✓	✓
Park and Tail Lighting		✓	
Park and Tail Lamp Circuits (board)		✓	✓
Park and Tail Lights (board)		✓	✓
Park and Tail Lights (panel)		✓	✓
Park, Tail, and Headlamp Circuits 1	✓	✓	✓
Park, Tail, and Headlamp Circuits 1 (board)		✓	✓
Park, Tail, and Headlamp Circuits 2 (board)		✓	✓
Stop and Backup Light Circuits			
Stop and Backup Lamps	✓	✓	✓
Stop and Backup Lamp Circuits (board)		✓	✓
Stop Lamp Circuit Investigation (board)		✓	✓
Stop Lamp Circuit Investigation (panel)		✓	✓
Backup Lamp Circuit Investigation (board)		✓	✓
Backup Lamp Circuit Investigation (panel)		✓	✓

Cont.

Topic/Lesson	P	I/P	R
Turn Signal Circuits			
Turn Signal Systems	✓	✓	✓
Turn Signal Circuit (board)		✓	✓
Turn Signal and Hazard Warning Circuit Investigation (board)		✓	✓
Turn Signal and Hazard Warning Circuit Investigation (panel)		✓	✓
Hazard Warning Lighting Circuit			
Hazard Warning Lamps	✓	✓	✓
Hazard Warning Circuit (board)		✓	✓
Internal Lighting Circuits			
Internal Lighting	✓	✓	✓
Internal Lamp Circuit Investigation (panel)		✓	✓
Internal Lamp Circuits (board)		✓	✓
Lighting Circuit Fault Diagnosis			
Introduction to Fault-Finding	✓	✓	✓
Lighting Fault Diagnosis	✓	✓	✓
Fault-Finding Example (board)		✓	✓
Lighting Circuit Fault Investigation 1 (board)		✓	✓
Lighting Circuit Fault Investigation 1 (panel)		✓	✓
Lighting Circuit Fault Investigation 2 (board)		✓	✓
Lighting Circuit Fault Investigation 2 (panel)		✓	✓
Lighting Circuit Fault Investigation 3 (board)		✓	✓
Lighting Circuit Fault Investigation 3 (panel)		✓	✓
Lighting Systems Fault Diagnosis 1		✓	✓
Lighting Systems Fault Diagnosis 1 (board)		✓	✓
Lighting Systems Fault Diagnosis 1 (panel)		✓	
Lighting Systems Fault Diagnosis 2		✓	
Lighting Systems Fault Diagnosis 3		✓	
Headlamp Lighting Fault 1 (board)		✓	✓
Headlamp Lighting Fault 2 (board)		✓	✓
Headlamp Lighting Fault 3 (board)		✓	✓
High Beam Flash Circuit Fault (board)		✓	✓
Low and High Beam Circuit Fault (board)		✓	✓
Three Pin Relay Headlamp Circuit Fault (board)		✓	✓
Four Pin Relay Headlamp Circuit Problem Solving (board)		✓	✓
Park and Tail Lamp Circuit Fault (board)		✓	✓
Park and Tail Lighting Fault (board)		✓	✓
Park, Tail, and Headlamp Circuit Fault 1 (board)		✓	✓
Park, Tail, and Headlamp Circuit Fault 2 (board)		✓	✓
Park, Tail, and Headlamp Circuit Problem Solving (board)		✓	✓
Backup Lamp Circuit Fault (board)		✓	✓
Turn Signal Circuit Fault (board)		✓	✓
Turn Signal and Hazard Warning Circuit Fault Investigation (board)		✓	✓
Turn Signal and Hazard Warning Circuit Fault Investigation (panel)		✓	✓
Hazard Warning Circuit Fault (board)		✓	✓
Interior Lamp Circuit Fault (board)		✓	✓



42 Automotive Transducers

Topic/Lesson	P	I/P	R
Transducer Circuits and Components			
Engine Coolant Temperature Sensor	✓	✓	✓
Coolant Temperature Sensor (board)		✓	✓
Coolant Temperature Sensor (panel)		✓	✓
Testing the Engine Coolant Temperature Sensor (workshop)		✓	✓
Mass Airflow Sensor	✓	✓	✓
Air Flow Sensor (board)		✓	✓
Air Flow Sensor (panel)		✓	✓
Intake Air Temperature Sensor	✓	✓	✓
Throttle Position Sensor	✓	✓	✓
Oxygen Sensor	✓	✓	✓
Oxygen Sensor (board)		✓	✓
Oxygen Sensor (panel)		✓	✓
Crankshaft Position Sensor	✓	✓	✓
Vehicle Speed Sensor (board)		✓	✓
Vehicle Speed Sensor (panel)		✓	✓
Performing a Gauge Circuit Test (workshop)		✓	

Cont.

Topic/Lesson	P	I/P	R
Transducer Fault Diagnosis			
Fault Investigation 1 (board)		✓	✓
Transducer Fault 1 (panel)		✓	✓
Fault Investigation 2 (board)		✓	✓
Fault Investigation 2 (panel)		✓	✓
Transducer Fault 2 (board)		✓	✓
Transducer Fault 2 (panel)		✓	✓
Fault Investigation 4 (board)		✓	✓
Fault Investigation 4 (panel)		✓	✓



43 Ignition Systems

Topic/Lesson	P	I/P	R
Ignition System Fundamentals			
Introduction to Ignition Systems	✓	✓	✓
Breaker Point Ignition Systems (board)		✓	✓
Breaker Point Ignition Systems (panel)		✓	✓
Transistor Assisted Ignition Systems (panel)		✓	✓
Transistor Assisted Ignition Systems (board)		✓	✓
Ignition Coil Investigation (panel)		✓	✓
Ignition Coil Investigation (board)		✓	✓
Spark Plugs	✓	✓	✓
Distributor Electronic Ignition Systems			
Inductive Reluctance Electronic Ignition Systems (panel)		✓	✓
Inductive Reluctance Electronic Ignition Systems (board)		✓	✓
Hall Effect Electronic Ignition Systems (panel)		✓	✓
Hall Effect Electronic Ignition Systems (board)		✓	✓
Distributorless Electronic Ignition Systems			
Distributorless Ignition Systems	✓	✓	✓
Distributorless Ignition Systems (panel)		✓	✓
Distributorless Ignition Systems (board)		✓	✓
DIS Trainer Features (auto rig)		✓	✓
DIS Trainer Operation (auto rig)		✓	✓
DIS Trainer Waveforms (auto rig)		✓	✓
DIS Trainer Temperature Sensor (auto rig)		✓	✓
DIS Trainer Crankshaft Sensor (auto rig)		✓	✓

Cont.

Topic/Lesson	P	I/P	R
Ignition System Servicing			
Inspection and Testing of the Ignition Primary Circuit (workshop)		✓	
Ignition Secondary Circuit Inspection (workshop)		✓	
Inspection and Testing of an Ignition Coil (workshop)		✓	
Distributor Testing (workshop)		✓	
The Magnetic Pulse Generating Pickup (workshop)		✓	
The Ignition Control Module (ICM) (workshop)		✓	
The Hall Effect Ignition System (workshop)		✓	
The Optical Ignition System (workshop)		✓	
Spark Plug Removal, Reading, Gapping, and Refitting (workshop)		✓	
Ignition System Wavepattern Investigation (workshop)		✓	
Ignition Timing Check and Adjustment (workshop)		✓	
Variable Dwell Investigation (workshop)		✓	
Testing Optical Ignition Systems (workshop)		✓	✓
Ignition System Diagnosis			
Lack of Power Problem (auto rig)		✓	✓
Extremely Rough Idle Problem 1 (auto rig)		✓	✓
Extremely Rough Idle Problem 2 (auto rig)		✓	✓
No Start Problem 1 (auto rig)		✓	✓
No Start Problem 2 (auto rig)		✓	✓
No Start Problem 3 (auto rig)		✓	✓
Troubleshooting Transistor Assisted Ignition Systems (panel)		✓	✓
Troubleshooting Transistor Assisted Ignition Systems (board)		✓	✓
Troubleshooting Breakerless Ignition Systems (panel)		✓	✓
Troubleshooting Breakerless Ignition Systems (board)		✓	✓
Troubleshooting Distributorless Ignition Systems (panel)		✓	✓
Troubleshooting Distributorless Ignition Systems (board)		✓	✓



44 Engine Management and Control

Topic/Lesson	P	I/P	R
Engine Management System Fundamentals			
Engine Management System	✓	✓	✓
Engine Management System Fundamentals (rig)		✓	✓
Electronic Control Unit	✓	✓	✓
Decision Making Processes (board)		✓	✓
Decision Making Processes (panel)		✓	✓
Fuel Injection System Decisions (board)		✓	✓
Fuel Injection System Decisions (panel)		✓	✓
Ignition System Decisions (board)		✓	✓
Ignition System Decisions (panel)		✓	✓
On Board Diagnostics Two (OBDII) Systems	✓	✓	✓
Starting Management, Control, and Regulation	✓	✓	✓
Air Management in a Diesel Engine	✓	✓	✓
Sensors			
Sensors and Actuators	✓	✓	✓
Sensor Components (rig)		✓	✓
Engine Sensor Fault Diagnosis 1		✓	
Engine Sensor Fault Diagnosis 2		✓	
Engine Coolant Temperature		✓	
Engine Coolant Temperature (panel)		✓	✓
Engine Coolant Temperature (board)		✓	✓
Actuators			
Actuator Components (rig)		✓	✓

Cont.

Topic/Lesson	P	I/P	R
Engine Inspection			
Thermostatic Air Cleaner Inspection and Test (workshop)		✓	
Positive Crankcase Ventilation System - Inspection and Test (workshop)		✓	
Pulse Air Injection System - Inspection and Test (workshop)		✓	
Evaporative Emissions Control Systems - Inspection and Test (workshop)		✓	
Retrieval and Clearing of OBD I Trouble codes (workshop)		✓	
Retrieval and Clearing of OBD II Trouble codes (workshop)		✓	
The Engine Coolant Temperature (ECT) Sensor (workshop)		✓	
The Throttle Position Sensor (TPS) (workshop)		✓	
The Oxygen (O2) Sensor (workshop)		✓	
The Intake Air Temperature (IAT) Sensor (workshop)		✓	
The Mass Airflow (MAF) Sensor (workshop)		✓	
The Idle Air Control (IAC) Valve (workshop)		✓	
The Digital EGR Valve (workshop)		✓	
Coolant Servicing (workshop)		✓	
Thermostat Servicing (workshop)		✓	
Engine Management Fault Investigation			
Engine Management System Fault Diagnosis	✓	✓	✓
Diesel Engine Fault Diagnosis	✓	✓	✓
Fault Investigation 5 (board)		✓	✓
Fault Investigation 5 (panel)		✓	✓
Fault Investigation 6 (board)		✓	✓
Fault Investigation 6 (panel)		✓	✓
Engine Fault Diagnosis 1 (rig)		✓	✓
Engine Fault Diagnosis 2 (rig)		✓	
Engine Fault Diagnosis 3 (rig)		✓	
Engine Fault Diagnosis 4 (rig)		✓	
Engine Fault Diagnosis 5 (rig)		✓	
Engine Fault Diagnosis 6 (rig)		✓	
Engine Fault Diagnosis 7 (rig)		✓	
Engine Fault Diagnosis 8 (rig)		✓	
Engine Fault Diagnosis 9 (rig)		✓	
Engine Fault Diagnosis 10 (rig)		✓	



45 Fuel and Emissions

Topic/Lesson	P	I/P	R
Air Induction Components and Operation			
Air Management	✓	✓	✓
Sensor Circuits and Components (rig)		✓	✓
Idle Air Control Valve (board)		✓	✓
Idle Air Control Valve (panel)		✓	✓
Fuel Components and Operation			
Fuel Injection Fundamentals	✓	✓	✓
Electronic Multipoint Fuel Injection Systems	✓	✓	✓
Fuel Injectors (board)		✓	✓
Fuel Injector Pulse Width (board)		✓	✓
Fuel Injector Pulse Frequency (board)		✓	✓
Fuel Injector Pulse Timing (board)		✓	✓
Fuel Injectors (panel)		✓	✓
Fuel Injector Pulse Width (panel)		✓	✓
Fuel Injector Pulse Frequency (panel)		✓	✓
Fuel Injector Pulse Timing (panel)		✓	✓
Electric Fuel Pump (board)		✓	✓
Electric Fuel Pump (panel)		✓	✓
Introduction to the EFI Demonstrator (rig)		✓	✓
Pressurized Fuel Systems (rig)		✓	✓
Fuel Injector Pulse Width (rig)		✓	✓
Fuel Injector Pulse Frequency (rig)		✓	✓
Fuel Injector Pulse Timing (rig)		✓	✓
EFI Fuel Injector Pulse Frequency (rig)		✓	✓
EFI Fuel Injector Pulse Timing (rig)		✓	✓
EFI Pressurized Fuel Systems (rig)		✓	✓
Fuel Injection Components (rig)		✓	✓
EFI Fuel Injector Pulse Width (rig)		✓	✓
Actuator Circuits and Components (rig)		✓	✓
Emission Control Systems			
Catalytic Converter	✓	✓	✓
Exhaust Gas Recirculation Systems	✓	✓	✓
Air Injection Systems	✓	✓	✓
Exhaust Emission Control Components (rig)		✓	✓
The Electronic Control Unit (ECU) (rig)		✓	✓

Cont.

Topic/Lesson	P	I/P	R
Fuel and Emissions System Servicing			
Fuel System Inspection (workshop)		✓	
Intake Air System Inspection (workshop)		✓	
Cold Enrichment System Inspection and Test (workshop)		✓	
Mixture Control Solenoid Duty Cycle Investigation (workshop)		✓	
Idle Speed and Fuel Mixture Adjustment (workshop)		✓	
Inspecting and Draining a Fuel System (workshop)		✓	
Fuel Filter Inspection (workshop)		✓	
Fuel Pump Inspection & Pressure Testing (workshop)		✓	
Fuel Pressure on an Electronic Fuel Injection System (workshop)		✓	
Throttle Body Injection Servicing (workshop)		✓	
Checking the Operation of Solenoid Operated Fuel Injectors (workshop)		✓	
Throttle Body Servicing (workshop)		✓	
Fuel Injector - Inspection, Testing, and Cleaning (workshop)		✓	
Turbocharger System - Inspection and Testing (workshop)		✓	
Fuel Trim and Exhaust Emissions Monitoring (workshop)		✓	
Fuel Injection System Fault Diagnosis	✓	✓	✓
Exhaust Gas Analyzer (workshop)		✓	
Exhaust System Inspection and Testing (workshop)		✓	
Investigation of Exhaust Emission Levels (workshop)		✓	
Catalytic Converter Inspection and Efficiency Testing (workshop)		✓	
Early Exhaust Recirculation System - Inspection and Test (workshop)		✓	
EFI Demonstrator Fault Diagnosis 1 (rig)		✓	
EFI Demonstrator Fault Diagnosis 2 (rig)		✓	
EFI Demonstrator Fault Diagnosis 4 (rig)		✓	
EFI Demonstrator Fault Diagnosis 5 (rig)		✓	
EFI Demonstrator Fault Diagnosis 6 (rig)		✓	
EFI Demonstrator Fault Diagnosis 7 (rig)		✓	
EFI Demonstrator Fault Diagnosis 8 (rig)		✓	
EFI Demonstrator Fault Diagnosis 9 (rig)		✓	
EFI Demonstrator Fault Diagnosis 10 (rig)		✓	
Diesel Engine Management			
Common Rail Diesel Engine	✓	✓	✓
Fuel in a Diesel Engine	✓	✓	✓
Fuel Injection Management in a Diesel Engine	✓	✓	✓
Exhaust Management System	✓	✓	✓



46 Electric and Hybrid Vehicle Technology

Topic/Lesson	P	I/P	R
Electric Vehicles			
Definition of Electric Vehicles	✓	✓	✓
Fuel Cells	✓	✓	✓
The Principle of the Fuel Cell	✓	✓	✓
Electric Motors	✓	✓	✓
Three-Phase AC	✓	✓	✓
Features of Electric Vehicles	✓	✓	✓
Range Extenders	✓	✓	✓
High Voltage Electric Vehicles			
High Voltage Vehicles	✓	✓	✓
Reasons for the Development of High Voltage Vehicles	✓	✓	✓
NiMH Batteries	✓	✓	✓
Principles of NiMH Batteries	✓	✓	✓
Lithium-ion Batteries	✓	✓	✓
Principles of Lithium-ion Batteries	✓	✓	✓
Safety with Batteries	✓	✓	✓
High Voltage Wiring and Connectors	✓	✓	✓
Voltage Converters	✓	✓	✓
The Inverter Principle	✓	✓	✓
The DC to DC Converter	✓	✓	✓
The Motor-Generator	✓	✓	✓
The Rotating Magnetic Field	✓	✓	✓
Safety in High Voltage Vehicles	✓	✓	✓
Legal Regulations	✓	✓	✓
Special Equipment for High Voltage Testing and Repair	✓	✓	✓
Working on High Voltage Vehicles	✓	✓	✓
Qualifications for Working on High Voltage Vehicles	✓	✓	✓
Hybrid Vehicles			
Classification of Hybrid Vehicles by Power Source	✓	✓	✓
Features of Hybrid Vehicles	✓	✓	✓
Classification of Hybrid Vehicles by Engine Arrangement	✓	✓	✓
Diagnose Insulation Measurement Faults	✓	✓	✓
Diagnose Equipotential Faults	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Hybrid and Electric Vehicle Systems			
Introduction to Hybrid and Electric Vehicles	✓		✓
Fuel and Emissions		✓	✓
Series Hybrid Systems	✓	✓	✓
Parallel Hybrid Systems	✓	✓	✓
Series Parallel Systems and Components	✓	✓	✓
Practical Series Parallel Hybrid Systems		✓	✓
Practical Series Parallel Hybrid Systems		✓	
Introduction to the Hybrid Vehicle Trainer	✓	✓	✓
Hybrid Vehicle Trainer Controls		✓	✓
Plug-in Electric Vehicles	✓	✓	✓
Plug-in Hybrid Vehicles	✓		✓
The High Voltage System		✓	✓
The Low Voltage System		✓	✓
Troubleshooting Introduction	✓	✓	✓
AC Motors and Generators	✓	✓	✓
AC Motors and Generators		✓	
Hybrid Electric Motors		✓	✓
Hybrid Electric Motors		✓	
Hybrid Engines	✓	✓	✓
Electronic Circuits and Modules	✓	✓	✓
Cables, Connectors and Protection Devices	✓	✓	✓
Introduction to Electrical Storage Devices	✓		✓
Lead Acid Batteries		✓	✓
Lead Acid Batteries		✓	
Nickel Metal Hydride Batteries		✓	✓
Lithium-ion Batteries		✓	✓
Battery Packs	✓	✓	✓
Battery Packs		✓	
Brake Systems	✓	✓	✓
Brake Systems		✓	
Hybrid Safety Issues and Concerns	✓		✓
Troubleshooting the High Voltage System		✓	✓
Disabling Hybrid Vehicle Systems		✓	✓
Disabling Hybrid Vehicle Systems		✓	
Disabling the High Voltage System		✓	



47 Networked Systems

Topic/Lesson	P	I/P	R
Networked Systems Structure			
The CAN Data Bus	✓	✓	✓
The LIN Data Bus	✓	✓	✓
The MOST Data Bus	✓	✓	✓
Networked Systems Data			
CAN Bus Data Processing	✓	✓	✓
Transmitting CAN Data	✓	✓	✓
CAN Signal Response	✓	✓	✓
CAN Bus Fault Diagnosis	✓	✓	✓

48 CAN Bus Lighting Systems

Topic/Lesson	P	I/P	R
Lighting Systems Operation			
Using Auto CAN Lighting for the First Time		✓	
CAN Bus Lighting Systems	✓	✓	✓
CAN Bus Lighting Systems (board)		✓	
CAN Bus Lighting Control	✓	✓	✓
CAN Bus Lighting Control (board)		✓	
CAN Bus Park, Tail, and Headlight Systems	✓	✓	✓
CAN Bus Park, Tail, and Headlight Systems (board)		✓	✓
CAN Bus Fog Light Systems	✓		✓
CAN Bus Fog Light Systems (board)		✓	✓
CAN Bus Turn Signal and Hazard Warning Systems	✓		✓
CAN Bus Turn Signal and Hazard Warning Systems (board)		✓	✓
CAN Bus Stop and Backup Light Systems	✓		✓
CAN Bus Stop and Backup Light Systems (board)		✓	✓
The Lighting Systems' CAN Bus	✓	✓	✓
The Lighting Systems' CAN Bus (board)		✓	✓
Lighting Systems Measurement			
CAN Bus Lighting Systems Measurement	✓		✓
CAN Bus Park and Tail Light System Measurement (board)		✓	✓
CAN Bus Headlight System Measurement (board)		✓	✓
CAN Bus Fog Light System Measurement (board)		✓	✓
CAN Bus Turn Signal and Hazard Warning System Measurement (board)		✓	✓
CAN Bus Stop and Backup Light System Measurement (board)		✓	✓
CAN Data Bus Measurement		✓	✓
CAN Data Bus Measurement (board)		✓	✓
Lighting Systems Diagnosis			
CAN Bus Lighting Faults	✓		✓
CAN Bus Lighting Fault 1 (board)		✓	✓
CAN Bus Lighting Fault 2 (board)		✓	
CAN Bus Lighting Fault 3 (board)		✓	
CAN Bus Lighting Fault 4 (board)		✓	
CAN Bus Lighting Fault 5 (board)		✓	
CAN Bus Lighting Fault 6 (board)		✓	
CAN Bus Lighting Fault 7 (board)		✓	
CAN Bus Lighting Fault 8 (board)		✓	
CAN Bus Lighting Control Fault 1 (board)		✓	✓
CAN Bus Lighting Control Fault 2 (board)		✓	✓



49 CAN Bus Auxiliary Systems

Topic/Lesson	P	I/P	R
Auxiliary Systems Operation			
Auxiliary CAN Bus Systems	✓	✓	✓
Effect of a Disconnected CAN Bus Control Module		✓	✓
The Auxiliary Systems' CAN Bus	✓	✓	✓
The Auxiliary Systems' CAN Bus (board)		✓	✓
CAN Bus Window, Mirror, and Seat Systems	✓		✓
CAN Bus Window, Mirror, and Seat Systems (board)		✓	✓
CAN Bus Power Door Locking System	✓		✓
CAN Bus Power Door Locking System (board)		✓	✓
Auxiliary CAN Bus Door Mirror Control Systems		✓	✓
Auxiliary CAN Bus Safety Systems		✓	✓
Auxiliary CAN Bus Security Systems		✓	✓
Auxiliary CAN Bus Window Control Systems		✓	✓
Auxiliary Systems Measurement			
CAN Data Bus Measurement		✓	✓
CAN Data Bus Measurement (board)		✓	✓
Multimeter Tests on an Auxiliary CAN Bus System		✓	✓
CAN Bus Window, Mirror, and Seat Systems Measurement	✓		✓
CAN Bus Mirror System Measurement (board)		✓	✓
CAN Bus Window System Measurement (board)		✓	✓
CAN Bus Seat System Measurement (board)		✓	✓
CAN Bus Power Door Locking System Measurement	✓		✓
CAN Bus Power Door Locking System Measurement (board)		✓	✓
Oscilloscope Tests on an Auxiliary CAN Bus System		✓	✓
Analyzer Tests on an Auxiliary CAN Bus System		✓	✓
Auxiliary Systems Diagnosis			
Testing Auxiliary CAN Bus Systems	✓	✓	✓
Auxiliary CAN Bus Fault Tolerance		✓	✓
Faults in Auxiliary CAN Bus Systems	✓	✓	✓
Open Circuit Auxiliary CAN Bus Faults		✓	✓
Short Circuit Auxiliary CAN Bus Faults		✓	✓
CAN Bus Auxiliary Faults	✓	✓	✓
CAN Bus Auxiliary Fault 1 (board)		✓	✓
CAN Bus Auxiliary Fault 2 (board)		✓	
CAN Bus Auxiliary Fault 3 (board)		✓	
CAN Bus Auxiliary Fault 4 (board)		✓	
CAN Bus Auxiliary Fault 5 (board)		✓	
CAN Bus Auxiliary Fault 6 (board)		✓	
CAN Bus Auxiliary Fault 7 (board)		✓	

50 CAN Bus Starting and Charging Systems

Topic/Lesson	P	I/P	R
Starting and Charging Systems Operation			
CAN Bus Starting and Charging Systems	✓		✓
The Starting and Charging Systems' CAN Bus	✓	✓	✓
The Starting and Charging Systems' CAN Bus (board)		✓	✓
CAN Bus Conventional Starting and Charging System (board)		✓	✓
CAN Bus Advanced Starting and Charging System (board)		✓	✓
Automatic Stop-Start System (board)		✓	✓
Starting and Charging Systems Measurement			
CAN Data Bus Measurement	✓	✓	✓
CAN Data Bus Measurement (board)		✓	✓
CAN Bus Starting and Charging Systems Measurement	✓		✓
CAN Bus Conventional Starting System Measurement (board)		✓	✓
CAN Bus Conventional Charging System Measurement (board)		✓	✓
CAN Bus Advanced Starting and Charging System Measurement (board)		✓	✓
Automatic Stop-Start System Measurement (board)		✓	✓
CAN Bus Power Consumers Measurement (board)		✓	✓
Starting and Charging Systems Diagnosis			
CAN Bus Starting and Charging Faults	✓	✓	✓
CAN Bus Starting and Charging Fault 1 (board)		✓	✓
CAN Bus Starting and Charging Fault 2 (board)		✓	
CAN Bus Starting and Charging Fault 3 (board)		✓	
CAN Bus Starting and Charging Fault 4 (board)		✓	
CAN Bus Starting and Charging Fault 5 (board)		✓	
CAN Bus Starting and Charging Fault 6 (board)		✓	
CAN Bus Starting and Charging Fault 7 (board)		✓	
CAN Bus Starting and Charging Fault 8 (board)		✓	



51 Automotive Heating and Air Conditioning

Topic/Lesson	P	I/P	R
Heating and Air Conditioning Fundamentals			
Air Conditioning Principles	✓	✓	✓
Air Conditioning Systems	✓	✓	✓
Air Conditioning Trainer (auto rig)		✓	✓
Air Conditioning Trainer Operation (auto rig)		✓	✓
Refrigeration Cycle (panel)		✓	✓
HVAC Components and Operation			
Compressors	✓	✓	✓
Lines and Hoses	✓	✓	✓
Condensers	✓	✓	✓
Air Distribution Control System Investigation (panel)		✓	✓
Air Distribution Control System Troubleshooting 1 (panel)		✓	✓
Air Distribution Control System Troubleshooting 2 (panel)		✓	✓
Air Distribution Control System Troubleshooting 3 (panel)		✓	✓
HVAC Electrical Controls Investigation (panel)		✓	✓
A/C Electrical System Fault Investigation (panel)		✓	✓
Blower Motor Fault Investigation 1 (panel)		✓	✓
Blower Motor Fault Investigation 2 (panel)		✓	✓
Compressor Fault Investigation (panel)		✓	✓
Climate Control System Operation (rig)		✓	✓

Cont.

Topic/Lesson	P	I/P	R
HVAC Servicing			
Discharging and Recharging an A/C System (panel)		✓	✓
A/C System Troubleshooting 1 (panel)		✓	✓
A/C System Troubleshooting 2 (panel)		✓	✓
Air Conditioning Practical (auto rig)		✓	✓
Air Conditioning System Performance Test (auto rig)		✓	✓
Inspection and Testing of Airflow Components (workshop)		✓	
Inspect Airflow Components on a Workshop Vehicle (workshop)		✓	
Testing Automatic Air Conditioning System Operation (workshop)		✓	
Cooling System Inspection (workshop)		✓	
Control Head and Component Servicing (workshop)		✓	
Heater and Air Management Service Procedure (workshop)		✓	
Testing For Leaks (workshop)		✓	
Testing A/C Fail Safe Switches (workshop)		✓	
Removal, Inspection, and Replacement of A/C Compressor Clutch (workshop)		✓	
Removing and Replacing the A/C Compressor (workshop)		✓	
Remove, Inspect, and Install A/C System Hose and Fittings (workshop)		✓	
Airflow Restrictions and Components (workshop)		✓	
Replacement and Inspection of Accumulator/Receiver-drier (workshop)		✓	
Servicing the FOT and TXV (workshop)		✓	
Inspection of A/C Evaporator Drain (workshop)		✓	
Filter Inspection and Installation (workshop)		✓	
A/C Compressor Clutch Removal (workshop)		✓	✓
Duratec Engine Air-conditioning System Servicing (rig)		✓	✓
Investigation of a FOTCC System (panel)		✓	✓
FOTCC System Troubleshooting (panel)		✓	✓



52 Auto Shop

Topic/Lesson	P	I/P	R
Automotive Technology			
Automotive Terminology	✓	✓	✓
Shop and Personal Safety			
Rules and Procedures 1	✓	✓	✓
Rules and Procedures 2	✓	✓	✓
Ventilation Procedures	✓	✓	✓
Marked Safety Areas and Evacuation Routes	✓	✓	✓
Fire Safety Equipment	✓	✓	✓
Fire Fighting	✓	✓	✓
First Aid 1	✓	✓	✓
First Aid 2	✓	✓	✓
Personal Protective Equipment 1	✓	✓	✓
Personal Protective Equipment 2	✓		✓
SRS, EBS, and Hybrid High Voltage Systems	✓	✓	✓
High Voltage Circuits	✓	✓	✓
Material Safety Data Sheets	✓	✓	✓
Tools and Equipment			
Tools and Test Equipment	✓		✓
Tool Usage	✓	✓	✓
Standard and Metric Designation	✓	✓	✓
Handling Tools and Equipment	✓	✓	✓
Handling Tools and Equipment (workshop)		✓	
Lifting Equipment	✓	✓	✓
Measuring with a Caliper, Micrometer, or Dial Gauge (workshop)		✓	
Tool Cleaning, Storage, and Maintenance	✓	✓	✓
Tool Cleaning, Storage, and Maintenance (workshop)		✓	
Preparing Vehicle for Service			
Repair Orders	✓	✓	✓
The Three Cs (Concern, Cause, and Correction) (workshop)		✓	
Vehicle Care	✓	✓	✓
Vehicle Service History	✓	✓	✓
Logical Fault Diagnosis	✓	✓	✓
Door Panel Removal and Replacement (workshop)		✓	
Preparing Vehicle for Customer			
Vehicle Preparation	✓	✓	✓

53 Passenger Safety Systems

Topic/Lesson	P	I/P	R
SRS Components and Operation			
Airbag Safety	✓	✓	✓
Introduction to SRS (rig)		✓	✓
Airbags (rig)		✓	✓
Seat Belts (rig)		✓	✓
SRS Inspection and Diagnosis			
Disabling and Enabling the Air Bag System (workshop)		✓	
SRS Faults (rig)		✓	✓
SRS Fault Diagnosis 1 (rig)		✓	
SRS Fault Diagnosis 2 (rig)		✓	
SRS Fault Diagnosis 3 (rig)		✓	
SRS Fault Diagnosis 4 (rig)		✓	
SRS Fault Diagnosis 5 (rig)		✓	
SRS Fault Diagnosis 6 (rig)		✓	



54 Heavy Vehicle Systems

Topic/Lesson	P	I/P	R
CI Engine Components			
HGV Diesel Engine Component Identification (rig)		✓	✓
HGV Diesel Engine Cylinders (rig)		✓	✓
HGV Diesel Engine Pistons (rig)		✓	✓
HGV Diesel Engine Cylinder Head and Valves (rig)		✓	✓
HGV Diesel Engine Systems (rig)		✓	✓
Engine Management System Fundamentals			
Electronic Control Module - Exercise 2.1		✓	✓
Cruise Control - Exercise 15.1		✓	✓
Cruise Control - Worksheet 22		✓	
Cruise Control - Worksheet 23		✓	
Gearbox Components and Operation			
Transmission Construction (rig)		✓	✓
HGV Gearbox Operation (rig)		✓	✓
HGV Gears and Gear Ratios (rig)		✓	✓
Selector Lever, Rail, and Synchronizers (rig)		✓	✓
Electronic Controlled Air Suspension			
Electronically Controlled Air Suspension (rig)		✓	✓
Electro-pneumatics (rig)		✓	✓
Solenoid Valve Unit (rig)		✓	✓
Height Sensor (rig)		✓	✓
Remote Control Unit (rig)		✓	✓
Electronic Controlled Air Suspension Fault Diagnosis 1 (rig)		✓	
Electronic Controlled Air Suspension Fault Diagnosis 2 (rig)		✓	
Electronic Controlled Air Suspension Fault Diagnosis 3 (rig)		✓	
Electronic Controlled Air Suspension Fault Diagnosis 4 (rig)		✓	
Electronic Controlled Air Suspension Fault Diagnosis 5 (rig)		✓	
Electronic Controlled Air Suspension Fault Diagnosis 6 (rig)		✓	
Electronic Controlled Air Suspension Fault Diagnosis 7 (rig)		✓	
Electronic Controlled Air Suspension Fault Diagnosis 8 (rig)		✓	
Electronic Controlled Air Suspension Fault Diagnosis 9 (rig)		✓	
Electronic Controlled Air Suspension Fault Diagnosis 10 (rig)		✓	

Cont.

Topic/Lesson	P	I/P	R
Lighting Systems			
Park, Tail, and Headlamp Circuits 1	✓	✓	✓
Turn Signal Systems	✓	✓	✓
Stop and Backup Lamps	✓	✓	✓
HGV Park, Tail and Headlights - Exercise 9.1		✓	✓
HGV Park, Tail and Headlights - Worksheet 8		✓	
HGV Turn Signal and Hazard Warning Lights - Exercise 11.1		✓	
HGV Turn Signal and Hazard Warning Lights - Exercise 11.2		✓	✓
HGV Turn Signal and Hazard Warning Lights - Worksheet 9		✓	
HGV Brake and Backup Lights - Exercise 13.1		✓	✓
HGV Brake and Backup Lights - Worksheet 10		✓	
HGV Auxiliary Lighting - Exercise 15.1		✓	✓
HGV Auxiliary Lighting - Worksheet 11		✓	
Auxiliary Electrical Systems			
Battery and Fuses - Exercise 3.1		✓	✓
Battery and Fuses - Worksheet 1		✓	
Battery and Fuses - Worksheet 2		✓	
Horn and Relays - Exercise 7.1		✓	✓
Horn and Relays - Worksheet 6		✓	
Horn and Relays - Worksheet 7		✓	
HGV Windshield Wiper System - Exercise 19.1		✓	✓
HGV Windshield Wiper System - Worksheet 13		✓	
Starting and Charging			
Starting Management, Control, and Regulation	✓	✓	✓
Starter and Solenoid - Exercise 5.1		✓	✓
Starter and Solenoid - Worksheet 3		✓	
Starter and Solenoid - Worksheet 4		✓	
Starter and Solenoid - Worksheet 5		✓	
HGV Alternator Charging Systems - Exercise 17.1		✓	✓
HGV Alternator Charging Systems - Worksheet 12		✓	
HGV Cold Starting Systems - Exercise 21.1		✓	✓
HGV Cold Starting Systems - Worksheet 14		✓	



54 Heavy Vehicle Systems Cont.

Topic/Lesson	P	I/P	R
Sensors			
Engine Protection - Exercise 4.1		✓	✓
Engine Management Analog Sensors - Exercise 8.1		✓	✓
Oil Temperature Sensor - Exercise 8.2		✓	
Manifold Air Temperature Sensor - Exercise 8.3		✓	
Oil Pressure Sensor - Exercise 8.4		✓	
Ambient Air Sensor - Exercise 8.5		✓	
Turbo Boost Pressure Sensor - Exercise 8.6		✓	
Throttle Position Sensor - Exercise 8.7		✓	
Engine Management Digital Sensors and Switches - Exercise 10.1		✓	
Engine Management Active Sensors - Exercise 12.1		✓	
Engine Management Analog Sensors - Worksheet 1		✓	
Engine Management Analog Sensors - Worksheet 2		✓	
Engine Management Analog Sensors - Worksheet 3		✓	
Engine Management Analog Sensors - Worksheet 4		✓	
Engine Management Analog Sensors - Worksheet 5		✓	
Engine Management Analog Sensors - Worksheet 6		✓	
Engine Management Analog Sensors - Worksheet 7		✓	
Engine Management Analog Sensors - Worksheet 8		✓	
Engine Management Analog Sensors - Worksheet 9		✓	
Engine Management Analog Sensors - Worksheet 10		✓	
Engine Management Analog Sensors - Worksheet 11		✓	
Engine Management Analog Sensors - Worksheet 12		✓	
Engine Management Analog Sensors - Worksheet 13		✓	
Engine Management Digital Sensors and Switches - Worksheet 14		✓	
Engine Management Digital Sensors and Switches - Worksheet 15		✓	
Engine Management Digital Sensors and Switches - Worksheet 16		✓	
Engine Management Digital Sensors and Switches - Worksheet 17		✓	
Engine Management Digital Sensors and Switches - Worksheet 18		✓	
Engine Management Active Sensors - Worksheet 19		✓	
Engine Management Active Sensors - Worksheet 20		✓	
Engine Management Active Sensors - Worksheet 21		✓	

Cont.

Topic/Lesson	P	I/P	R
Actuators			
Engine Management Actuators - Exercise 18.1		✓	✓
Engine Management Actuators - Worksheet 24		✓	
Engine Management Actuators - Worksheet 25		✓	
Engine Management Actuators - Worksheet 26		✓	
Engine Management Actuators - Worksheet 27		✓	
Engine Management Actuators - Worksheet 28		✓	
Engine Management Actuators - Worksheet 29		✓	
Engine Management Actuators - Worksheet 30		✓	
Engine Management Actuators - Worksheet 31		✓	
Engine Management Actuators - Worksheet 32		✓	
Diesel Engine Management			
The Fuel Valve - Exercise 18.2		✓	
Fuel Injection - Exercise 18.3		✓	
Injector Pulse Width - Exercise 18.4		✓	
Injector Timing - Exercise 18.5		✓	
Idle Speed Adjustment - Exercise 18.6		✓	
The Fan Clutch - Exercise 18.7		✓	
Engine Exhaust Emissions - Exercise 6.1		✓	✓



55 Motorcycle Lighting

Topic/Lesson	P	I/P	R
Lamp Circuits			
Using a Multimeter (board)	✓	✓	✓
Low and High Beam Headlamps (board)	✓	✓	✓
Park / Tail Lamp Circuits (board)	✓	✓	✓
Stop Lamps (board)	✓	✓	✓
Turn Signal Lamps (board)	✓	✓	✓
Park / Tail Lamps and Headlamps (board)		✓	✓
Park / Tail Lamp and Headlamp Circuit Assignment (board)		✓	
Park / Tail Lamps and Relay Controlled Headlamps (board)	✓		✓
Instrument Panel Lighting Circuit (board)		✓	
Relay Circuits			
Relays (board)	✓	✓	✓
Relay-Controlled Headlamp Circuit (board)		✓	
Relay-Controlled Headlamp Flash Circuit (board)	✓	✓	✓
Three Pin Relays and Headlamps (board)	✓	✓	✓
Four Pin Relays and Headlamps (board)		✓	✓
Four Pin Relay Headlamp Circuit Assignment (board)		✓	

Cont.

Topic/Lesson	P	I/P	R
Fault Finding			
Fault Finding (board)	✓	✓	✓
Low and High Beam Circuit Fault (board)		✓	
Park / Tail Lamps Circuit Fault (board)		✓	
Park / Tail Lamp and Headlamp Circuit Fault (board)		✓	
Stop Lamp Circuit Fault (board)		✓	
Turn Signal Circuit Fault (board)		✓	
Three Pin Relay Headlamp Circuit Fault (board)		✓	
Four Pin Relay Headlamp Circuit Fault (board)		✓	
Park / Tail Lamp and Relay Controlled Headlamp Fault (board)		✓	
Relay-Controlled Headlamp Flash Circuit Fault (board)		✓	



56 Engineering Mathematics

Topic/Lesson	P	I/P	R
Units of Measure			
Units of Measurement		✓	✓
Approximation			
Approximations		✓	✓
Arithmetic			
Multiply Sums		✓	✓
Adding and Subtracting		✓	✓
Multiplication and Division of Decimal Numbers		✓	✓
Fractions			
Fractions - Addition and Subtraction		✓	✓
Fractions - Multiplication and Division		✓	✓
Use Fractions		✓	✓
Simplify Fractions		✓	✓
Expand Fractions		✓	✓
Convert Mixed Numbers into Improper Fractions		✓	✓
Convert Improper Fractions into Mixed Numbers		✓	✓
Add and Subtract Fractions with the Same Denominator		✓	✓
Add and Subtract Fractions with Different Denominators		✓	✓
Convert Fractions to Decimal Numbers		✓	✓
Convert Decimal Numbers to Fractions		✓	✓
Percentages			
Percentages (Part of 100)		✓	✓
Percentages		✓	✓
Calculate Percentages of Values		✓	✓
Calculate Percentage Increases		✓	✓
Calculate Percentage Reductions		✓	✓
Parts per Thousand		✓	✓
Length, Area and Volume			
Lengths, Surface Area and Volume		✓	✓
Lengths, Units and Prefixes		✓	✓
Calculate the Perimeter of a Rectangle		✓	✓
Calculate the Area of a Rectangle		✓	✓
Calculate the Area of a Complex Shape		✓	✓
Calculate Volume		✓	✓
Graphs and Charts			
Graphs - Straight Line Graphs		✓	✓
Graphs - Square Law		✓	✓
Graphs - Pie Chart		✓	✓
Equations			
Transposing Equations		✓	✓

Cont.

Topic/Lesson	P	I/P	R
Performing Calculations		✓	✓
Sign Rules for Mathematical Operations		✓	✓
Distributive Law		✓	✓
Multiply Out Brackets		✓	✓
Structure Equations		✓	✓
Transform Equations by Addition and Subtraction		✓	✓
Transform Equations by Multiplication and Division		✓	✓
Transpose Equations		✓	✓
Calculate the Unknown Variable in an Equation		✓	✓
Equating Method for Solving Simultaneous Equations		✓	✓
Addition Method for Solving Simultaneous Equations		✓	✓
Algebra			
Algebra - Simple Formula		✓	✓
First, Second, and Third Order Brackets		✓	✓
Rule of Three (Direct Proportion)		✓	✓
Rule of Three (Inverse Proportion)		✓	✓
Factorisation			
Simple Factorisation		✓	✓
Indices			
Working with Powers and Standard Form	✓	✓	✓
Indices - Powers of 10		✓	✓
Indices - Addition and Subtraction		✓	✓
Indices - Multiplication and Division		✓	✓
Indices - Letter Notation		✓	✓
Powers		✓	✓
Indices		✓	✓
Square Roots		✓	✓
Angles			
Angular Measure		✓	✓
Measuring Angles	✓	✓	✓
Calculating with Angles	✓	✓	✓
Trigonometry			
Lengths and Pythagoras' Theorem	✓	✓	✓
Pythagoras' Theorem		✓	✓
Basic Trigonometry		✓	✓
Phasors			
Phase Angles		✓	✓
Phasor Diagrams		✓	✓
Number Systems			
Binary and Decimal Conversions		✓	✓



57 English Language Skills

Topic/Lesson	P	I/P	R
Language			
Language Acquisition		✓	
Reading			
Citing Strong and Thorough Evidence		✓	
Identifying and Analyzing Ideas in a Text		✓	
Understanding and Interpreting a Text		✓	
Understanding the Different Meanings of Language		✓	
Understanding the Structure of a Text		✓	
Determining a Writer's Perspective		✓	
Understanding Multiple Sources of Information		✓	
Evaluating Arguments and Specific Claims Made in a Text		✓	
Speaking and Listening			
Planning, Writing, Presenting, and Evaluating		✓	
Discussing Different Perspectives		✓	
Justifying Decisions with Reasoning		✓	
Engaging in Group Discussions		✓	
Presenting a Perspective to an Audience		✓	
Speak on the Telephone		✓	✓
How to Introduce Yourself		✓	✓
Listening and Understanding		✓	✓
Engage in a Two-Way Conversation		✓	✓

Cont.

Topic/Lesson	P	I/P	R
Writing			
Arguing a Perspective		✓	
Presenting a Persuasive Perspective		✓	
Formal Letters with a Perspective		✓	
Creating an Informative Text		✓	
Informing an Audience		✓	
Writing an Informative Article		✓	
Understanding and Using Perspective in a Narrative		✓	
Writing Reality as a Narrative		✓	
Writing History		✓	



58 Business Skills

Topic/Lesson	P	I/P	R
Fundamentals of Business Organisation			
Corporate Mission and Goals	✓	✓	✓
Business Organisational Structure	✓	✓	✓
Quality and Environmental Management	✓	✓	✓
Business Process Optimisation	✓	✓	✓
Procurement			
Management of Hazardous Substances	✓	✓	✓
Stock Control and the Production Process	✓	✓	✓
Organising Procurement	✓	✓	✓
Material Requirements Planning (MRP)	✓	✓	✓
Purchasing Calculations	✓	✓	✓
Monitoring Purchasing	✓	✓	✓
International Commercial Terms and Contracts	✓	✓	✓
Warehousing	✓	✓	✓
Controlling Procurement	✓	✓	✓
Material Procurement	✓	✓	✓
Production			
Production Management	✓	✓	✓
Analytical Techniques	✓	✓	✓
Product Range	✓	✓	✓
Product Range Development	✓	✓	✓
Production Planning	✓	✓	✓
Production Process Planning	✓	✓	✓
Production Process Control	✓	✓	✓
Improving Production	✓	✓	✓
Quality Control	✓	✓	✓
Controlling Production	✓	✓	✓
Cost Accounting			
Marginal Cost Calculations	✓	✓	✓
Financial Accounting and Bookkeeping			
The Inventory	✓	✓	✓
Purchase Cost Calculations	✓	✓	✓
Balance Sheet Changes	✓	✓	✓
Balance Sheet Accounting	✓	✓	✓
Profit and Loss Accounts	✓	✓	✓
Inventory Accounting: The Perpetual Method	✓	✓	✓
Inventory Accounting: The Periodic Method	✓	✓	✓
List Price Determination	✓	✓	✓
Accruals and Pre-Payments	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Accounting - Valuation Principles	✓	✓	✓
Valuation of Balance Sheet Items	✓	✓	✓
Sales and Marketing			
Marketing Planning	✓	✓	✓
Product and the Marketing Mix	✓	✓	✓
Pricing Strategies	✓	✓	✓
Advertising and the Marketing Mix	✓	✓	✓
Communications and the Marketing Mix	✓	✓	✓
Distribution and the Marketing Mix	✓	✓	✓
Control of the Customer's Order	✓	✓	✓
Sales and Marketing Measures	✓	✓	✓
Social Skills			
Punctuality		✓	✓
Dress Code		✓	✓
Personal Space		✓	✓
Handle Collective Property		✓	✓
Common Courtesy		✓	✓
Legal Framework			
Types of Contracts	✓	✓	✓
Process Chains and Networks	✓	✓	✓
Breach of Contract	✓	✓	✓
Contracts and UN Law	✓	✓	✓
Economics			
Economic Systems	✓	✓	✓
Economic Flow Models	✓	✓	✓
Economic Measures	✓	✓	✓
Monetary Policy and Price Level Stability	✓	✓	✓
Production Factors	✓	✓	✓
Location Factors	✓	✓	✓
Pricing and Types of Markets	✓	✓	✓
Needs,Wants and Demand	✓	✓	✓
Investing and Financing			
Investment Planning	✓	✓	✓
Investment Analysis	✓	✓	✓
Financing Rules	✓	✓	✓
Internal Financing	✓	✓	✓
Profit and Loss Analysis	✓	✓	✓
External Financing	✓	✓	✓
The Financial Plan and Leasing	✓	✓	✓



59 Freight Logistics

Topic/Lesson	P	I/P	R
Basics of Storage			
The Organisation of Storage	✓	✓	✓
Storage and Warehouse Technology	✓	✓	✓
Storage of Goods			
The Storage of Different Types of Goods	✓	✓	✓
Storage and Retrieval Criteria	✓	✓	✓
Storage Costs	✓	✓	✓
Storage Issues	✓	✓	✓
Picking Stock			
Organisation of Picking	✓	✓	✓
Key Figures of Picking	✓	✓	✓
Packaged Goods			
Packaging	✓	✓	✓
Packaging Aids	✓	✓	✓
Packaging of Goods	✓	✓	✓
Efficiency and Optimisation of the Warehouse			
Storage Indicators	✓	✓	✓
Quality Management in the Warehouse	✓	✓	✓
Loading			
Loading Goods Overview	✓	✓	✓
Internal Transport and Loading			
Securing Loads	✓	✓	✓
Conveying	✓	✓	✓
Picking Vehicles and Lifting Equipment	✓	✓	✓
Loading Systems	✓	✓	✓
Internal Transport and Loading Overview	✓	✓	✓
Unloading Goods	✓	✓	✓
Human Resources			
Accident Prevention in the Warehouse	✓	✓	✓
Handling of Hazardous Materials	✓	✓	✓

Cont.

Topic/Lesson	P	I/P	R
Route Planning			
Legal Regulations for Shipping	✓	✓	✓
Freight Costs	✓	✓	✓
Event Driven Process Chain for Route Planning	✓	✓	✓
Transporting Hazardous Materials	✓	✓	✓
Accompanying Documents	✓	✓	✓
Stowage Planning			
Stowage Calculations	✓	✓	✓
Planning for Stowage	✓	✓	✓
Stowage Planning for Dangerous Goods	✓	✓	✓
Event Driven Process Chains			
EPC Diagrams	✓	✓	✓
Information Processing			
The Network	✓	✓	✓
The Intranet and Internet	✓	✓	✓
Privacy Policy	✓	✓	✓
The Workstation Computer	✓	✓	✓



60 Workplace Problem Solving

Topic/Lesson	P	I/P	R
Production			
Running a Bicycle Parts Production Line	✓	✓	✓
Running Two Production Lines for Bicycle Parts	✓	✓	✓
Paint Mixing - Calculating Materials	✓	✓	✓
Machine Productivity for Cutting Metal Shapes	✓	✓	✓
Mass Production - Calculating Quantities	✓	✓	✓
Comparing Machine Productivities	✓	✓	✓
Choosing Packaging for Parts	✓	✓	✓
Calculating Costs in a Food Factory	✓	✓	✓
Programming a Drinks Bottling Plant	✓	✓	✓
Setting Up a Paint Filling Machine	✓	✓	✓
Distribution			
Calculating Shipping Costs	✓	✓	✓
Planning Logistics	✓	✓	✓
Construction			
Car Park Construction - Calculating Materials	✓	✓	✓
Perimeter Fencing - Calculating Materials	✓	✓	✓
Installing a Flag Pole	✓	✓	✓
Tiling a Bathroom Floor	✓	✓	✓
Sales and Marketing			
Sales Conversion - Calculating Rates	✓	✓	✓
Calculating Sales Discounts	✓	✓	✓
Finance			
Upgrading a Vehicle Fleet	✓	✓	✓
Phone Contracts - Comparing Deals	✓	✓	✓
Calculating Costs for a Building Project	✓	✓	✓
Comparing Crane Hire Costs	✓	✓	✓
Calculating Stationery Costs	✓	✓	✓
Calculating VAT Rates	✓	✓	✓
Customer Service			
Handling a Telephone Call	✓	✓	✓
Human Resources			
Visiting a Construction Site	✓	✓	✓
Improving the Workplace	✓	✓	✓
Attending a Meeting	✓	✓	✓
Choosing a Computer Monitor	✓	✓	✓
Workforce Planning	✓	✓	✓

61 Interactive Applications

Topic/Lesson	P	I/P	R
Engineering Applications			
Engineering Applications		✓	
Automotive Applications			
Automotive Applications		✓	



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