Working with STEM Digital Library

ljcreate.com
## Contents

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LIB 3: 01 Materials Engineering

**Materials**
- Ceramic and Sintered Materials
- Classification of Materials
- Composite Materials
- Corrosion
- Iron and Steel
- Lubrication
- Non-Ferrous Metals
- Polymers

**Properties of Materials**
- Characteristics of Materials

**Structure of Materials**
- Interpretation of Test Results
- Materials Testing - Hardness and Non-Destructive Testing
- Materials Testing - Tensile and Impact Testing
- Microstructure of Alloys
- Microstructure of Metals
- Microstructures of Steel
- Solutions and Phases

LIB 3: 02 Engineering Drawing

**Drawing Elements**
- Drilling and Finishes
- Fluid Power Diagrams
- Machine Elements
- Permanent Connections
- Screws and Threaded Components

**Engineering Drawing**
- Basic Geometric Construction
- Co-ordinate Systems
- Dimensions
- Drawing Analysis
- Drawing Standards
- Roughness
- Sectional Views
**LIB 3: 03 Fluid Power**

**Fluid Power**
- Calculations of Hydraulic Power
- Calculations of Pressure and Flow Rate
- Electropneumatics
- Fluid Power Cylinders
- Fluid Power Formulas
- Logic Controls
- Pneumatics Diagrams, Series and Parallel Circuits and Time Delays

**LIB 3: 04 Manufacturing Engineering**

**Basics of CNC**
- Preparatory Programming - Turning

**CNC Programming**
- A- and B-Axes
- C-Axis
- CNC and the Basics of Programming
- CNC Milling
- CNC Programming for Milling
- CNC Programming for Turning
- CNC Turning
- Cycle Programming - Milling
- Cycle Programming - Turning
- Multiple Axis Turning and Milling
- Preparatory Programming - Milling
- Programming Linear and Tangential Start-Up and Coast-Down - Milling

**Information Technology**
- Charting Data
- Planning and Organizing Work Processes
- Process Planning

**Joining**
- Forces in Threaded Joints
- Forces on Threads
- Formula and Calculation of Tightening Torque
- Joining Procedures
- Joining with Glues
- Joining with Keys and Splines
- Joining with Pins, Bolts and Rivets
- Joining with Soldering
- Joining with Threads
- Lapping
- Screw Connections
- Soldering Equipment and Safety
Manufacturing Processes
- Bending
- Bending Operation Calculations
- Cutting and Angles of Cutting
- Cutting Metal
- Cutting Speed for Drilling
- Determining Data for Grinding
- Determining Data for Milling
- Determining Data for Turning
- Drilling
- Environmental Protection
- Erosive Manufacturing Processes
- Finishing Processes
- Forces on the Cutting Tool
- Forging
- Forming - Material Use and Scrap
- Forming Calculations
- Forming Procedures
- Grinding - Processes and Machines
- Hard Metal Cutting
- Honing
- Machine Tools and Terminology
- Manufacturing Processes
- Milling - Processes and Machines
- Primary Metal Shaping Processes
- Reading Machine Diagrams
- Safety and Protective Measures

Welding
- Arc Welding
- Gas Welding
- Gas-Shielded Welding
- Joining with Welding

LIB 3: 05 Machine and Instrument Engineering

Bearings
- Bearing Assemblies and Fit
- Bearings
- Calculation of Forces on Bearings
- Joining Hubs to Shafts
- Plain Bearings
- Rolling-Element Bearings
- Seals and Gaskets
Engineering

Electronics Test Equipment
- Signal and Pulse Generators

Engineering Science
- Calculating Work, Power and Efficiency
- Energy, Work and Efficiency
- Manufacturing Facilities
- Mass and Volume Flow Rate
- Material Conversion
- Mechanical Units

Gears
- Adjustable Speed Transmission
- Clutches
- Gear Calculations
- Gear Design Factors
- Gear Drives
- Simple and Compound Gears

LIB 3: 06 Inspection, Maintenance and Quality Management

Inspection Technology and Quality Management
- Accuracy
- Calculating Lengths
- Calculation of Clearances and Fits
- Clearances and Fits
- Measurement Tolerances
- Measuring Lengths
- Quality Management

Maintenance
- Diagnostics and Troubleshooting
- Fault Repair
- Maintenance and Accident Prevention
- Maintenance Documentation
- Maintenance Inspection
- Maintenance Principles
- Mechanical Breakdown

LIB 3: 07A Industrial Control Systems

Feedback Control Systems
- Characteristics of an Air Flow Transducer
- Characteristics of an Air Pressure Transducer
- Characteristics of an IC Temperature Sensor
- Characteristics of an NTC Thermistor
- Controller Responses
Effect of Loading on the Potentiometer Output Voltage
Environmental Measurement
Light Controlled System
On/Off Control Systems
ON/OFF Heater System
Positional Resistance Transducers
Proportional Control - Step Input Response

Number Systems
Hexadecimal and Binary Number Systems

LIB 3: 07B Industrial Control PLCs

Fieldbus Systems
Introduction to Fieldbus
Profibus DP

Industrial Network Systems
HMI Interactions
HMI Panel Alarms
HMI Panel Data Logging
HMI Panel Monitoring and Supervising
HMI Panel Process Control
HMI Panel Real-time Data
HMI Panel Recipes
HMI Panel Sharing PLC Data
HMI Panel Trend Analysis
HMI Panel Trends
Industrial Network Security
Industrial Networks
Introduction to SCADA
Networking Industrial Control Devices
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PETRA II Plant Control Program (Two PLCs and HMI)
Smart Sensors
PLC Advanced Industrial Control
- Carrying Out Tests on the PETRA II Parts
- Complete PETRA II Control Program
- Configure STEP 7 PLC Tags
- Moving a Part Round the PETRA II
- PETRA II Plant Control Program (Single PLC)
- Programming the PETRA II Carriage
- Programming the PETRA II Transfer Arm

PLC Conveyor System Control
- Analogue Inputs
- Analogue Outputs
- Construction and Function of a PLC
- Counters
- Counting Parts
- Create a New Project
- Create a New STEP 7 Project
- Create a STEP 7 Project
- Enter a Ladder Program
- Enter a STEP 7 Ladder Program
- Flip-Flop Latches
- Global Variables
- Identifying the Requirements
- Introduction to PLCs
- Ladder Programming
- Latches
- Latching an Airlock
- Memory Stores
- Run a Ladder Program
- Run a STEP 7 Ladder Program
- Sequence Control System

PLC Part Sorting Control
- Creating a New Project
- Creating a STEP 7 Project
- Sorting Parts

Programmable Logic Control
- Basic Structure of a PLC
- Components of a Sequence Control System
- Connecting a PLC
- Converting Logical Circuit to Functional Plan
- GRAFCET Sequence Control Systems
- PLC Programming
- Programmable Logic Controllers (PLC)
- Programmable Logic Controllers (PLCs)
Electronics

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Alarm Systems
- Components of Intruder and Fire Alarms
- Installing Intruder Alarms and Fire Alarms

Closed Loop Control
- An Example On/Off Control System
- Automatic Temperature Control
- RC Circuit Responses

Components
- Alternative Components
- Characteristics of Non-Linear Components
- Maintenance Information and Component Selection
- Problem Solving - Identify Electronic Components
- Problem Solving - Recognize and Select Components

Energy and Power
- Extending System Life
- Small Energy Sources

Fault Finding Electronic Systems
- Electronic Systems Maintenance
- Fault Conditions
- Fault Location Techniques
- Faults and Fault Finding Aids
- Problem Solving - Testing and Fault Finding on Electronic Components

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- Analogue Signal Processing
- Electronic Systems
- Inputs, Outputs and Processes
- Measurement of Non-Electrical Quantities

LIB 3: 09 DC Circuits

Capacitor Circuits
- Calculating Total Capacitance
- Capacitance of Capacitors
- Capacitor Discharge Curve
- Capacitor Timing Circuits
- Capacitors
- Capacitors in Series and Parallel
- Charging and Discharging a Capacitor
- Interconnection of Capacitors
- Resistance and the Time Constant
Electronics

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- Calculation of Electrical Power
- Electrical Power

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- Inductors - Graphs and Equations

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- Applications of Ohm's Law
- Calculating Resistance Colour Code Values and Tolerance
- Calculating the Resistor Value for an LED Lamp Circuit
- Changing the Resistance in an LED Circuit
- Colour Code and Tolerance
- Electrical Power and Resistor Colour Coding
- Gradient of Linear Voltage-Current Graphs
- Investigating a Characteristic Graph for a Resistive Component
- Investigating Whether Resistors are in Tolerance
- Measuring Resistance
- Non-Linear Resistances
- Relationship between Voltage, Current and Resistance
- Resistance and Conductance
- Resistance and Conductance Reciprocal Calculations
- Resistance Characteristics
- Resistor Characteristics and Applications
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- Basic Electrical Quantities in Circuits
- Circuit Diagrams
- Electric Current and Safety
- Electrical Principles
- Handling Voltage Calculations
- Introduction to Electric Current
- Measurement in Circuits
- Measuring Current in a Circuit
- Measuring Voltage
- Potential Difference and Voltage
Internal Resistance
- Internal Resistance
- Internal Resistance of Power Sources

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- Calculations using Kirchhoff’s Second Law
- Current Behaviour at a Node
- Kirchhoff’s First Law
- Kirchhoff’s Second Law

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- Calculating the Extension of the Range of a Voltmeter
- Calculating the Extension of the Range of an Ammeter
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- Measurement of Voltage using a Wheatstone Bridge - Method 1
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- Calculating the Resonant Frequency of an LC Oscillator Circuit
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- Diacs and Triacs

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- Class B and AB Transistor Amplifiers
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- Field Effect Transistor Operation
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- Controlling Contactors
- Current Flow in Latching Circuits
- Latching in Contactor Circuits
- Selection of Contactors
Electronics

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- Efficiency of Electric Motors

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- Connecting a Frequency Converter
- Construction and Function of Frequency Converters
- EMC
- Frequency Converter Parameters
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- Interlock Systems
- Motor Drive Protection Circuit
- Motor Installations and Safety
- Motor Protection

Motors and Motor Control
- Analog Interfacing
- Characteristics of a DC Permanent Magnet Motor
- Characteristics of a DC Solenoid
- Characteristics of an Air Valve
- Characteristics of an Induction Motor
- Connecting a Motor
- Derivative Control Ramp Response
- Digital Control
- Integral Control Step Response
- Linear and Rotational Motion
- Motor Drive Connection Components
- Motor Starting and Speed Control
- PID Control Step Response
- Proportional Position Control
- Proportional Speed Control

Three-phase AC
- Delta Calculations
- Delta Connection
- Generation of Three-phase AC
- Representation of Three-phase AC

LIB 3: 17 Digital Electronics

Combinational Logic
- Basic Logic Functions and Their Algebra
- Boolean Algebra
- Boolean Algebra and De Morgan’s Theorems
- Building EXOR Gates from Other Gates
Electronics

- Characteristics of a Schmitt Inverter Gate
- Characteristics of the EX-OR and EX-NOR Circuit
- Circuits involving Combinational Logic
- Combinational Logic
- Equivalent Logic Circuits
- Karnaugh Maps
- Logic Families
- Logic Gates

Digital Systems

- Analogue to Digital Conversion
- BCD UP/DOWN Counters and 7-Segment Decoder/Driver/Displays - Exercise 2.2
- Binary Counters and 7-Segment Displays
- Binary-Coded Decimal Counters
- Characteristics of an Analog Comparator
- Decoder Operation
- Demultiplexer Operation
- Digital to Analogue Conversion
- Encoder Operation
- Encoder-Decoder System
- Encoders and Decoders
- Glitches in Digital Systems
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- Multiplexers and Demultiplexers
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Electronics

Interfacing
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- Industry Standards
- Interfacing in Digital Circuits

Number Systems
- Calculations in Binary
- Conversion Between Number Systems

Sequential Logic
- Asynchronous Counters
- Binary Counters
- Bistable Devices
- Characteristics of a D-Type 2-bit Shift Register
- Characteristics of a D-Type Flip-Flop
- Characteristics of a J-K Flip-Flop
- Counting with Bistables
- D-Type Flip-Flop
- Integrated Circuit Memory
- Shift Registers

Signal Processing
- Digital Signal Processing

LIB 3: 18 Telecommunications

Antennas
- Antenna and Broadband Options
- Installing Antenna and Broadband Connections

Digital Data Transmission
- Digital Data Transmission
- Flow Control

Electronic Communication Principles
- AM Transmission
- Electronic Communication Systems
- Optical Transmission
- Phase Locked Loops
- Simplex and Duplex Transmission

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- Fault Finding Telecommunication Circuits W1
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Fiber Optics
- Fiber Optic Cables
LIB 3: 19 Microprocessors

Architecture and Operation of a Microprocessor
- Architecture
- Principles of Operation

Developing PIC Programs
- Controlling a Motor
- Debugging Programs
- Full Washing Machine Sequence

Memory
- Embedded Computers and RAM/Flash Memory

Microprocessor System Applications
- Microprocessor System Applications

Number Systems, Instructions and Subroutines
- Instruction Groups
- Number Systems

Program Development
- Designing a Program
- Entering and Running a Program

LIB 3: 20 Circuit Construction and Testing

Automatic Light Circuit
- Building and Testing an Automatic Light Circuit

Baby Alarm
- Building a Baby Alarm

Building Circuits on Printed Circuit Boards
- Building Circuits on PCB
- Constructing the Continuity Tester on PCB

Building on Breadboard
- Breadboarding
- Building the Automatic Light Circuit on Breadboard
- Planning an Automatic Light Circuit on Breadboard

Building on Stripboard
- Building and Testing the Anti-Theft Device
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Electronic Problem Solving
  - Problem Solving - Construct an Electronic Circuit
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Flashing Doorbell Circuit
  - Building a Flashing Doorbell Circuit
  - Flashing Doorbell Circuit

Freezer Temperature Warning Circuit
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Improved Automatic Light Circuit
  - Building and Testing an Improved Automatic Light Circuit

Intruder Alarm
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  - Latched Buzzer Circuit
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Lamp Circuit
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LED Lamp Circuit
  - Building an LED Lamp Circuit

Polarity Tester
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  - AC to DC Concepts and Principles
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Road Crossing Controller
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- Equivalent Logic Circuits 1 - Exercise 6.1
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- Characteristics of a 1 to 1-of-4-line Demultiplexer Circuit - Exercise 3.2
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- Characteristics of an Analog Switch, S - R Bistable System - Exercise 1.5
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- D-A Converter IC and an A-D Converter Circuit - Worksheet 11
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- Fault Diagnosis - Triangle Waveform Generator Circuit - Worksheet 12
- Full Adder Circuits - Exercise 6.1
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- Multiplexer and Demultiplexer Circuits - Worksheet 8
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Developing PIC Programs
- Analog to Digital Conversion - Exercise 15
- Digital to Analog Conversion - Exercise 16
- EEPROM Programming - Exercise 14
- Interrupts - Exercise 10
- Keyboard Scanning - Exercise 12
- Logic Systems - Exercise 8
- Simple Closed Loop Process Control - Exercise 17

Programming Applications
- Basic Input/Output - Exercise 7
- Program Development - Exercise 6

The PIC Development System
- Interfacing - Exercise 5
- PIC Software - Exercise 4

The PIC Microcontroller
- Microprocessors, Microcomputers and Microcontrollers - Exercise 1
- Number Systems - Exercise 3
- Overview of PIC Microcontrollers - Exercise 2
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### Single Engine Aircraft Battery Power System
- Electronics/Avionics Busbar Isolation - Exercise 2.2
- Power Distribution - Exercise 2.1
- Single Engine Aircraft Electrical Systems - Worksheet W1
- Single Engine Aircraft Electrical Systems - Worksheet W2
- Single Engine Power Distribution Systems - Worksheet W3
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### Single Engine Aircraft Fuel Flow Measurement
- Fuel Measurement Using a Tank Resistor - Exercise 7.1
- Fuel Quantity and Fuel Flow Measurement - Worksheet W10
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- Optical Rotor Fuel Flow Measurement and Digital Display - Exercise 7.2

### Single Engine Aircraft Fuel Quantity Measurement
- Fuel Measurement Using a Capacitor Bridge - Exercise 6.1
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### Single Engine Aircraft Power Consuming Circuits
- Early Internal Lighting Systems - Exercise 5.1
- Electrical Landing Gear Control and Indication Systems - Exercise 7.2
- Flap Control Systems - Exercise 8.1
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- Hydraulic Landing Gear Control and Indication Systems - Exercise 7.1
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- Landing, Taxi and Anti-Collision Lights - Exercise 6.3
- Single Engine Auxiliary Power Supply Systems - Exercise 3.2
- Single Engine External Lighting Systems - Worksheet W10
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### Single Engine Aircraft Power Generation System
- A Typical 1979 Alternator System - Exercise 4.2
- A Typical Alternator System From 1963 To 1968/69 - Exercise 4.1
- Cessna Single Engine Electrical Power Systems - Worksheet W7
- Cessna Single Engine Electrical Power Systems - Worksheet W8
- Single Engine Power Supply Systems - Worksheet W5
- Single Engine Power Supply Systems - Worksheet W6

### Single Engine Aircraft Stall Warning Systems
- A Stall Warning System using a Vane Switch - Exercise 1.1
- Single Engine Aircraft Stall Warning Systems - Worksheet W1
Single Engine Aircraft Take-Off Warning Systems
- Basic Logic Gates - Exercise 2.1

Single Engine Aircraft Temperature Measurement
- Nickel Wire Sensor Temperature Systems - Worksheet W4
- Nickel Wire Sensor Temperature Systems - Worksheet W5
- Nickel Wire Temp Sensor - Ratiometer and Analog Display - Exercise 4.3
- Nickel Wire Temp Sensor - Wheatstone Bridge and Analog Display - Exercise 4.1
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LIB 3: 28 Electronic Systems (Series 9 Practice)

Components
- Amplifier and Loudspeaker
- Applying Power to a Device
- DC Operated Buzzer
- Light Dependent Resistor - LDR
- Logic Source Switches
- Output Driver
- Relay
- Seven Segment Display (Digital Signals)

Signal Processing
- Analog Signals
- Automatic Light Switch System
- Combined Analog/Digital Signals
- Creating a Reference Voltage
- Digital Signals
- Fire Detector (Sprinkler) System
- Latching Switch System
- Lighting/Temperature Failure Warning System
- Sensor Voltage Divider

LIB 3: 29 Electronic Principles (Series 9 Practice)

AC Circuits
- Alternating Current - AC
- Alternating Voltage Values
- Capacitor on an AC Supply
- Capacitors in Parallel
- Capacitors in Series
- Capacitors with AC Applied
- Inductors with AC Applied
- Plotting Frequency Responses of RC and RL Circuits
- Capacitor Charge Time
- Capacitor on a DC Supply
- CR Integrator
Electronics

- Investigation of a Wheatstone Bridge
- Kirchhoff's Current Law
- Kirchhoff's Voltage Law
- Other Ways to Calculate Power
- Resistor Measurements
- Series-Parallel Combinations

Magnetism and Electromagnetism
- Attraction and Repulsion
- Electromagnet Field Plot
- Electromagnetic Induction
- Investigating Change-Over and Latching Circuits
- Investigation of a Basic Transformer
- Other Magnetic Materials

LIB 3: 30 Linear Electronics (Series 9 Practice)

Current Amplifier Circuits
- 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
- Operation of a Current Amplifier

Operational Amplifier Circuits
- AC Comparator
- Feedback Amplifier
- Gain-Bandwidth Product in Practice
- Investigation of an Integrator
- Non-Inverting Amplifier
- Regenerative Comparator Under AC Conditions
- Regenerative Comparator Under DC Conditions
- Slew Rate Limitation of an Amplifier

LIB 3: 31 Semiconductors (Series 9 Practice)

Diodes
- Half-Wave Rectifier

SCRs
- Capacitor Commutation
- CR Phase Shift Control Circuit
- DC Control of an SCR with AC Applied
- Silicon Controlled Rectifier - SCR

Transistor Amplifiers
- Common Collector Amplifier - Emitter Follower
- Differential Amplifier Under AC Conditions
- Differential Amplifier Under DC Conditions
Electronics

- Elimination of Crossover Distortion
- Emitter Decoupling Capacitor
- Emitter Follower Circuits
- Investigation of the Amplifier with an Applied Signal
- JFET Common Source Amplifier Investigation
- Loading a Voltage Divider
- Measurement of Quiescent Voltages
- Simple Current Biasing

Transistors

- Current Gain Characteristic
- Darlington Pair Switch Circuit
- Investigation of an N-channel JFET
- NPN Transistor Switch
- Output Characteristic
- Regenerative NPN/PNP Switch

LIB 3: 32 Digital Electronics (Series 9 Practice)

Combinational Logic

- AND Gate From NAND Gates
- Boolean Expressions From Logic Circuits
- Combinational Logic Circuits
- Diode Logic
- Diode Transistor Logic (DTL)
- Logic Gate Switches
- NOR Gate From NAND Gates
- NOT Gate From a NAND Gate
- Operation of the Schmitt NOT Gate
- OR Gate From NAND Gates

Digital Systems

- 1-4 Line Demultiplexer
- 2-1 Multiplexer
- 2-4 Line Decoder
- 4-1 Line Multiplexer
- 4-2 Line Encoder
- 4-Bit Binary Full Adder
- 4-Bit Magnitude Comparator
- Analog Switch
- Analog to Digital Converter
- Astable IC Circuit
- BCD Counter and 7-Segment Decoder
- Bi-Directional Switch
- Digital to Analog Converter
- Encoder-Decoder Circuit
- Full Adder
- Half Adder
- Monostable IC Circuit
Electronics

- Multiplexer-Demultiplexer Circuit
- Seven-Segment Display

Number Systems
- Practical Investigation of Number Systems

Sequential Logic
- 3-Bit Down-Counter
- 3-Bit Up-Counter
- Binary Counter IC
- D-Type (Data) Flip-Flop
- Modulo-N Counter

LIB 3: 33 Microprocessors (Series 9 Practice)

Developing PIC Programs
- Defining Device Type and Clock Speed
- Introduction to Interrupts
- Loops and Conditional Branching
- Programming Fundamentals

PIC Microcontroller
- Arithmetic and Logic Operations
- Commands to set up an Interrupt on Portb
- Creating Delays

The PIC Development System
- Introduction to the PIC Basic Software
- Introduction to the PICShell Software
- Introduction to the Software and Hardware

The PIC Microcontroller
- Features of a PIC
- Introduction to PICs
LIB 3: 34 Engine Repair

**Cylinder Head and Valve Trains**
- Camshafts and Valve Lifters
- Components of the Top End
- Engine Cycles, Valve and Ignition Timing

**Engine Block**
- Bottom End Component Identification
- CI Engine Size
- Components of the Bottom End
- Crankshaft and Piston Operation
- Engine Blocks and Liners
- Engine Size
- Pistons
- Pressure and Volume

**Engine Fundamentals**
- Common Rail Diesel Engine Component Identification
- Common Rail Diesel Engine Operation
- Four Stroke Cycle
- Front End Component Identification
- Introduction to Engine Systems
- Position and Mounting of Engine Components
- Sectioned (CI) Engine Component Identification

**Engine Servicing**
- Adjustment of Valve Clearances on an OHC Engine
- Basic Engine Service Procedures
- Camshaft Timing Verification
- Cooling System Inspection, Test and Repair
- Cylinder Compression Test
- Cylinder Leakage Test
- Cylinder Power Balance Test
- Engine Removal and Replacement
- Inspect and Repair Threads
- Manifold Vacuum Test

**Lubrication and Cooling Systems**
- Adjusting Drive Belt Tension
- Cooling Systems
- Engine Oil Pressure
- Lubrication System Inspection
- Lubrication Systems
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- Inspecting and Draining a Fuel System
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- Measuring Air Flow with Variable RPM (CI Engine)
- Measuring Air Flow with Variable RPM (SI Engine)
- Measuring Cylinder Pressure with Variable RPM (CI Engine)
- Measuring Cylinder Pressure with Variable RPM (SI Engine)
- Measuring Fuel Use with Variable RPM (CI Engine)
- Measuring Fuel Use with Variable RPM (SI Engine)
- Measuring Oil Pressure with Variable RPM (CI Engine)
- Measuring Oil Pressure with Variable RPM (SI Engine)
- Measuring the Effect of Load on Torque (CI Engine)
- Measuring the Effect of Load on Torque (SI Engine)
- Measuring Torque with Variable RPM (CI Engine)
- Measuring Torque with Variable RPM (SI Engine)
Support

LIB 3: 61 Engineering Mathematics

Algebra
- Algebra - Simple Formula
- First, Second, and Third Order Brackets
- Rule of Three (Direct Proportion)
- Rule of Three (Inverse Proportion)

Angles
- Angular Measure
- Calculating with Angles
- Measuring Angles

Approximation
- Approximations

Arithmetic
- Adding and Subtracting
- Multiplication and Division of Decimal Numbers
- Multiply Sums

Equations
- Addition Method for Solving Simultaneous Equations
- Calculate the Unknown Variable in an Equation
- Distributive Law
- Equating Method for Solving Simultaneous Equations
- Multiply Out Brackets
- Performing Calculations
- Sign Rules for Mathematical Operations

Factorization
- Simple Factorization

Fractions
- Add and Subtract Fractions with Different Denominators
- Add and Subtract Fractions with the Same Denominator
- Convert Decimal Numbers to Fractions
- Convert Fractions to Decimal Numbers
- Convert Improper Fractions into Mixed Numbers
- Convert Mixed Numbers into Improper Fractions
- Expand Fractions
- Fractions - Addition and Subtraction
- Fractions - Multiplication and Division
- Simplify Fractions

Graphs and Charts
- Graphs - Pie Chart
- Graphs - Square Law
- Graphs - Straight Line Graphs
Support

Indices
- Indices
- Indices - Addition and Subtraction
- Indices - Letter Notation
- Indices - Multiplication and Division
- Indices - Powers of 10
- Powers

Length, Area and Volume
- Calculate the Area of a Complex Shape
- Calculate the Area of a Rectangle
- Calculate the Perimeter of a Rectangle
- Calculate Volume
- Lengths, Surface Area and Volume
- Lengths, Surface Area, and Volume
- Lengths, Units and Prefixes

Number Systems
- Binary and Decimal Conversions

Percentages
- Calculate Percentage Increases
- Calculate Percentage Reductions
- Calculate Percentages of Values
- Parts per Thousand
- Percentages

Phasors
- Phase Angles
- Phasor Diagrams

Trigonometry
- Basic Trigonometry
- Lengths and Pythagoras’ Theorem
- Pythagoras’ Theorem

LIB 3: 62 English Language Skills

Language
- Language Acquisition

Reading
- Citing Strong and Thorough Evidence
- Determining a Writer’s Perspective
- Evaluating Arguments and Specific Claims Made in a Text
- Identifying and Analysing Ideas in a Text
Support

Speaking and Listening
- Discussing Different Perspectives
- Engage in a Two-Way Conversation
- Engaging in Group Discussions
- How to Introduce Yourself
- Justifying Decisions with Reasoning
- Listening and Understanding
- Planning, Writing, Presenting, and Evaluating
- Presenting a Perspective to an Audience

Writing
- Arguing a Perspective
- Creating an Informative Text
- Formal Letters with a Perspective
- Informing an Audience
- Presenting a Persuasive Perspective

LIB 3: 63 Business Skills

Cost Accounting
- Marginal Cost Calculations

Economics
- Economic Flow Models
- Economic Measures
- Economic Systems
- Location Factors
- Monetary Policy and Price Level Stability
- Needs, Wants and Demand
- Pricing and Types of Markets
- Production Factors

Financial Accounting and Bookkeeping
- Accounting - Valuation Principles
- Accruals and Pre-Payments
- Balance Sheet Accounting
- Balance Sheet Changes
- Inventory Accounting: The Periodic Method
- Inventory Accounting: The Perpetual Method
- List Price Determination
- Profit and Loss Accounts
- Purchase Cost Calculations

Fundamentals of Business Organization
- Business Organizational Structure
- Business Process Optimization
- Corporate Mission and Goals
- Quality and Environmental Management
Investing and Financing
- External Financing
- Financing Rules
- Internal Financing
- Investment Analysis
- Investment Planning
- Profit and Loss Analysis

Legal Framework
- Breach of Contract
- Contracts and UN Law
- Process Chains and Networks

Procurement
- Controlling Procurement
- International Commercial Terms and Contracts
- Management of Hazardous Substances
- Material Procurement
- Material Requirements Planning (MRP)
- Monitoring Purchasing
- Organizing Procurement
- Purchasing Calculations

Production
- Analytical Techniques
- Controlling Production
- Improving Production
- Product Range
- Product Range Development
- Production Management
- Production Planning
- Production Process Control
- Production Process Planning
- Quality Control

Sales and Marketing
- Advertising and the Marketing Mix
- Communications and the Marketing Mix
- Control of the Customer’s Order
- Distribution and the Marketing Mix
- Marketing Planning
- Pricing Strategies
- Product and the Marketing Mix
- Product Promotion
- Sales and Marketing Measures

Social Skills
- Common Courtesy
- Dress Code
Support

- Handle Collective Property
- Personal Space
- Punctuality

LIB 3: 64 Freight Logistics

**Efficiency and Optimization of the Warehouse**
- Quality Management in the Warehouse

**Event Driven Process Chains**
- EPC Diagrams

**Human Resources**
- Accident Prevention in the Warehouse
- Handling of Hazardous Materials

**Information Processing**
- Privacy Policy

**Internal Transport and Loading**
- Conveying
- Internal Transport and Loading Overview
- Loading Systems
- Picking Vehicles and Lifting Equipment
- Securing Loads

**Loading**
- Loading Goods Overview

**Packaged Goods**
- Packaging
- Packaging Aids
- Packaging of Goods

**Picking Stock**
- Key Figures of Picking
- Organization of Picking

**Route Planning**
- Accompanying Documents
- Event Driven Process Chain for Route Planning
- Freight Costs
- Legal Regulations for Shipping

**Stowage Planning**
- Planning for Stowage
Support

LIB 3: 65 Workplace Problem Solving

Construction
- Car Park Construction - Calculating Materials
- Installing a Flag Pole
- Perimeter Fencing - Calculating Materials

Customer Service
- Handling a Telephone Call

Distribution
- Calculating Shipping Costs
- Planning Logistics

Finance
- Calculating Costs for a Building Project
- Calculating Stationery Costs
- Calculating VAT Rates
- Comparing Crane Hire Costs
- Phone Contracts - Comparing Deals

Human Resources
- Attending a Meeting
- Choosing a Computer Monitor
- Improving the Workplace

Production
- Calculating Costs in a Food Factory
- Choosing Packaging for Parts
- Comparing Machine Productivities
- Machine Productivity for Cutting Metal Shapes
- Mass Production - Calculating Quantities
- Paint Mixing - Calculating Materials
- Programming a Drinks Bottling Plant
- Running a Bicycle Parts Production Line
- Running Two Production Lines for Bicycle Parts
- Setting Up a Paint Filling Machine

Sales and Marketing
- Calculating Sales Discounts
- Sales Conversion - Calculating Rates

LIB 3: 66 Interactive Applications

Automotive Applications
- Automotive Applications

Engineering Applications
- Engineering Applications