Advanced Electronics

Catalogue Number	3020-0000
Category	Electronics and Electrical Control
Duration	15 Hours

Activity 1: Integrated Circuits

An Overview of Integrated Circuits

Integration Levels

SSI Circuits

Pin Numbering

Propagation Delay Time

Rise and Fall Time

Voltages and Currents

Fan Out

Logic Families

Transistor Logic Family

Metal Oxide Silicon

Components with Traits from Various Families

Activity 2: Logic Gates

Electronic Logic Gates

Logic Gates

OR Logic Gate

Task: Constructing a Truth Table for an OR Logic Gate

AND Gate

Task: Constructing a Truth Table for an AND Logic

Further Information about AND Gates

NOT Gate

Task: Completing a Truth Table for Multiple Gates

Task: Constructing a Truth Table for a Complex Circuit

Task: Representing Complex Circuits with Various Inputs

Task: Completing a Truth Table for a Gate with Multiple Inputs

Activity 3: More Logic Gates

Conventions for Integrated Circuits and Logic Gates

The NOR Gate

Task: Constructing a Truth Table for a NOR Gate

The NAND Gate

Task: Constructing a Truth Table for Multiple NAND Gates

Exclusive OR and Exclusive NOR Gates

Activity 4: Boolean Algebra

Introduction to Boolean Algebra

Task: Illustrating the Practical Use of Boolean Algebra

Practical Application of Boolean Algebra

Rules of Boolean Algebra

Task: Using Truth Tables to Prove Boolean Algebra

Task: Examining a Reduced Expression in a Truth Table

Task: Comparing Boolean Expressions

Applying Boolean Algebra to Logic Circuits

Activity 5: Binary Arithmetic

Conversions - A Binary Addition

Task: Binary Addition

Demonstrating Binary Addition

Using Circuits to Sum

Binary Subtraction

Task: Binary Subtraction

Representing a Negative Binary Number for Digital Systems

Enabling Mathematical Operations in Digital Systems

2`s Complements

Adding and Subtracting Using a 2`s Complement

Activity 6: Flip-Flops

S-R Flip-Flops

Task: Operating a Flip-Flop

Practical Application of Flip-Flops

Synchronous Operation

Synchronization and Clock Signals

Synchronization Within a Computer

D Flip-Flops

Master-Slave Flip-Flops

Activity 7: Types of Flip-Flops

S-R Type Flip-Flops

D-Type Flip-Flops

D Flip-Flops with Set and Reset Inputs

J-K Flip Flops

T Flip-Flops

Activity 8: Shift Registers

Types of Data

Clocks

Shift Registers

Operation of SISO and SIPO Shift Registers

Task: Operating a Shift Register

Operation of a PISO Shift Register

Multiple Type Shift Registers

Practical Applications of Shift Registers

Activity 9: Counters

Introduction to Counters

T Flip-Flops

Operation of T Flip-Flops

Task: Operating a T Flip-Flop

Analysis Using a Timing Diagram

Decimal Counters

Dividing Frequencies by Any Number

Activity 10: Digital to Analog Conversion

The Process of Analog-Digital-Analog Conversion

Operational Amplifiers

Methods of Converting Digital Data to Analog Format

Task: Examining Digital to Analog Conversion with an Operational Amplifier

Output Scales

Conversion Using Ladder Networks

Capacitor DACs

Activity 11: Analog to Digital Conversion

Analog Data in Daily Life

Counter Converters

Up/Down Counter ADCs

Successive Approximation

Other Analog to Digital Conversion Methods

Activity 12: Data Acquisition

Acquiring Data

Data from Measuring Devices

Switches

Switches in Electronic Circuits

Various Switches

Keyboards

Task: Operating a Diode Matrix System

Priority Encoders

Activity 13: Sensors

What are Sensors?

Temperature Sensors

Magnetic Sensors

Capacitive Sensors

Inductive Sensors

Photoelectric Sensors

Light Intensity Sensors

Pressure Sensors

Motion Sensors

Additional Sensor Types

Activity 14: Displays

Status Displays

Indicator Display Circuits

Seven-Segment Displays

Task: Displaying Numbers on a Seven-Segment Display

Task: Displaying Characters

Task: Using a Seven-Segment Display to Show Words

Illuminating Segments in a Seven Segments Display

Efficiency of Seven-Segment Displays

Time-Sharing Displays

Liquid Crystal Displays

Activity 15: Circuit Analysis

Buzzer Circuit

Voltage Meter Circuit

Flashing LED Circuit

Comprehensive Post-Test