

Module 5: Soldering & Advanced Repair (Classes 17–20)

Module Duration: 8 Hours (4 Classes × 2 Hours)

Module Overview

This module introduces students to professional soldering techniques and advanced motherboard repair procedures used in modern mobile phone servicing. Students will learn how to solder and desolder electronic components, use a hot air rework station, replace SMD components and ICs, repair damaged PCB tracks using jumper techniques, and restore water-damaged motherboards. Emphasis is placed on precision, safety, ESD protection, and industry-standard repair practices.

Module Learning Objectives

After completing this module, students will be able to:

- Understand soldering materials and techniques.
 - Perform safe soldering and desoldering operations.
 - Operate a hot air rework station.
 - Replace SMD components and integrated circuits (ICs).
 - Repair damaged PCB tracks using jumper wires.
 - Replace charging ICs using proper rework procedures.
 - Clean and restore water-damaged motherboards.
 - Apply advanced repair techniques while maintaining safety and quality standards.
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Class 17 (2 Hours)

Soldering Basics

Learning Outcomes

After completing this class, students will be able to:

- Understand soldering principles.
 - Identify soldering materials.
 - Perform basic soldering and desoldering.
 - Apply proper ESD and safety procedures.
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17.1 Introduction to Soldering

Soldering is the process of joining electronic components to a PCB using molten solder.

Applications

- Component replacement
 - Connector repair
 - PCB repair
 - IC installation
 - Mobile motherboard servicing
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17.2 Solder Wire

Solder wire is a metal alloy used to create electrical and mechanical connections.

Types

- Lead-Solder (Sn/Pb)
- Lead-Free Solder (RoHS Compliant)

Characteristics

- Good electrical conductivity
 - Low melting point
 - Strong mechanical bond
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17.3 Flux

Flux is a chemical agent that removes oxidation and improves solder flow.

Functions

- Cleans metal surfaces
- Prevents oxidation
- Improves solder adhesion
- Produces stronger solder joints

Types

- Liquid Flux
 - Gel Flux
 - Paste Flux
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17.4 Solder Paste

Solder paste is a mixture of powdered solder and flux used mainly for SMD component installation.

Applications

- IC replacement
 - SMD soldering
 - Reflow soldering
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17.5 Desoldering

Desoldering is the process of removing solder to replace or repair components.

Methods

- Desoldering Pump
 - Desoldering Wick (Copper Braid)
 - Hot Air Rework
 - Soldering Iron
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17.6 Soldering Safety

Always:

- Wear ESD protection.

- Work in a ventilated area.
 - Avoid overheating components.
 - Keep the soldering tip clean.
 - Use heat-resistant tools.
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Practical Exercise

Students will:

- Tin the soldering iron tip.
 - Practice soldering wires.
 - Solder resistors and capacitors on a practice PCB.
 - Remove components using a desoldering pump and wick.
 - Inspect solder joints under a microscope.
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Assignment

Prepare a comparison chart of solder wire, flux, and solder paste, including their uses and advantages.

Class 18 (2 Hours)

Hot Air Rework & SMD Component Replacement

Learning Outcomes

Students will be able to:

- Operate a hot air rework station.
 - Identify SMD components.
 - Remove and install ICs safely.
 - Perform rework without damaging the PCB.
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18.1 Hot Air Rework Station

A hot air rework station uses controlled hot air to remove and install electronic components.

Main Controls

- Temperature
 - Airflow
 - Nozzle Selection
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18.2 SMD Components

Surface Mount Device (SMD) components are mounted directly on the PCB surface.

Common SMD Components

- Resistors
 - Capacitors
 - Inductors
 - Diodes
 - MOSFETs
 - ICs
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18.3 IC Removal

Steps

1. Apply flux.
 2. Set the correct temperature and airflow.
 3. Heat the IC evenly.
 4. Lift the IC gently with tweezers.
 5. Clean the PCB pads.
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18.4 IC Installation

Steps

1. Clean PCB pads.

2. Apply solder paste or flux.
 3. Align the IC accurately.
 4. Heat evenly using the rework station.
 5. Inspect solder joints under a microscope.
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18.5 Common Mistakes

- Excessive heat
 - Incorrect airflow
 - Poor alignment
 - Insufficient flux
 - Damaging PCB pads
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Practical Exercise

Students will:

- Configure the hot air station.
 - Remove an SMD resistor or capacitor.
 - Replace an SMD component.
 - Practice installing a demonstration IC.
 - Inspect solder quality under a microscope.
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Assignment

Explain the correct procedure for removing and installing an SMD IC safely.

Class 19 (2 Hours)

PCB Repair & Jumper Techniques

Learning Outcomes

Students will be able to:

- Repair damaged PCB tracks.
 - Perform jumper wire repairs.
 - Replace charging ICs.
 - Restore damaged connectors.
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19.1 PCB Track Repair

PCB tracks are copper pathways that carry electrical signals.

Causes of Damage

- Corrosion
 - Excessive heat
 - Mechanical damage
 - Improper repair
 - Water damage
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19.2 Jumper Techniques

A jumper wire bypasses a broken PCB track.

Materials

- Enamel Copper Wire
 - Micro Jumper Wire
 - Flux
 - UV Mask (optional)
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19.3 Connector Repair

Common connectors

- Charging Port
- Battery Connector
- Display Connector
- Camera Connector
- SIM Connector

Repair Steps

- Inspect pins.
 - Clean contacts.
 - Replace damaged connectors if necessary.
 - Test continuity after repair.
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19.4 Charging IC Replacement

Symptoms

- No charging
- Slow charging
- Charging stops intermittently
- Overheating while charging

Replacement Procedure

1. Remove the faulty IC using hot air.
 2. Clean solder pads.
 3. Apply flux.
 4. Position the new IC.
 5. Reflow solder.
 6. Test charging function.
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Practical Exercise

Students will:

- Repair a damaged PCB track using a jumper wire.
 - Replace a damaged connector (demonstration or practice board).
 - Replace a charging IC on a training PCB.
 - Verify repairs using a multimeter.
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Assignment

Draw a simple PCB track repair using a jumper wire and explain each step.

Class 20 (2 Hours)

Water Damage Repair & Motherboard Cleaning

Learning Outcomes

Students will be able to:

- Diagnose water-damaged smartphones.
- Clean corrosion from motherboards.
- Use ultrasonic cleaning equipment.
- Restore hardware safely after liquid exposure.

20.1 Water Damage

Water damage is one of the most common causes of smartphone failure.

Common Sources

- Rain
- Dropped into water
- Beverage spills
- High humidity
- Saltwater exposure

20.2 Immediate Actions

When a water-damaged phone is received:

- Power off the device immediately.
- Do not attempt to charge it.
- Remove the battery if possible.
- Disassemble the device.
- Inspect for corrosion.

20.3 PCB Cleaning

Cleaning removes contaminants and corrosion.

Cleaning Materials

- Isopropyl Alcohol (90% or higher)
- Soft Brush
- Lint-Free Cloth
- Compressed Air

20.4 Corrosion Removal

Corrosion can damage PCB tracks and components.

Procedure

1. Inspect under a microscope.
2. Apply isopropyl alcohol.
3. Gently brush affected areas.
4. Dry the motherboard thoroughly.
5. Inspect again before testing.

20.5 Ultrasonic Cleaning

An ultrasonic cleaner removes dirt and corrosion using high-frequency sound waves.

Advantages

- Cleans hard-to-reach areas
- Removes oxidation
- Improves repair success rate
- Reduces manual cleaning time

20.6 Post-Cleaning Inspection

Verify:

- No remaining corrosion
 - No damaged tracks
 - No missing components
 - Connectors are clean
 - PCB is completely dry
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Practical Exercise

Students will:

- Inspect a water-damaged motherboard.
 - Clean the PCB using isopropyl alcohol.
 - Demonstrate ultrasonic cleaning (where available).
 - Dry and inspect the motherboard.
 - Test the repaired board for functionality.
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Assignment

Prepare a step-by-step procedure for repairing a water-damaged smartphone.

Software & Tools Used

- Temperature-Controlled Soldering Station
- Hot Air Rework Station
- Digital Microscope
- Digital Multimeter
- DC Regulated Power Supply
- Solder Wire
- Lead-Free Solder
- Flux (Liquid/Gel)
- Solder Paste
- Desoldering Pump
- Desoldering Wick (Copper Braid)
- Precision Tweezers
- PCB Holder
- Jumper Wire

- UV Mask (Optional)
 - Isopropyl Alcohol (90%+)
 - Soft Cleaning Brush
 - Ultrasonic Cleaner (if available)
 - ESD Wrist Strap
 - ESD Mat
 - Heat-Resistant Mat
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Practical Projects

- Basic PCB Soldering Practice
 - SMD Component Replacement
 - IC Removal and Installation
 - PCB Track Repair Using Jumper Wire
 - Charging IC Replacement
 - Connector Repair
 - Water-Damaged Motherboard Cleaning
 - Corrosion Removal and Functional Testing
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Module Assessment

Assessment	Marks
Quiz	10
Practical Exercises	30
Advanced PCB Repair Project	30
Water Damage Repair & Functional Testing	20
Viva	10
Total	100

Module Learning Outcomes

After successfully completing **Module 5: Soldering & Advanced Repair**, students will be able to:

- Perform professional soldering and desoldering using appropriate tools and materials.
- Safely operate a hot air rework station to remove and install SMD components and integrated circuits.

- Repair damaged PCB tracks using jumper wire techniques and restore connector functionality.
- Replace charging ICs and verify successful power and charging operation.
- Diagnose, clean, and restore water-damaged smartphone motherboards using industry-standard cleaning and corrosion removal methods.
- Apply advanced mobile hardware repair techniques while maintaining ESD protection, workplace safety, and quality control standards expected in professional mobile repair laboratories and service centers.