

Module 3: Mobile Components & Replacement (Classes 8–11)

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

Module Overview

This module focuses on the identification, diagnosis, replacement, and testing of common smartphone hardware components. Students will gain hands-on experience replacing displays, batteries, charging ports, cameras, speakers, microphones, vibrator motors, and fingerprint sensors using professional repair techniques. Emphasis is placed on safe handling, correct installation procedures, and post-repair quality testing.

Module Learning Objectives

After completing this module, students will be able to:

- Identify various smartphone display technologies.
 - Replace damaged LCD/OLED displays.
 - Understand battery technology and battery health.
 - Replace smartphone batteries safely.
 - Diagnose and repair charging port issues.
 - Identify different charging connector types.
 - Replace camera modules and audio components.
 - Replace fingerprint sensors and vibration motors.
 - Perform complete functionality tests after component replacement.
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Class 8 (2 Hours)

LCD, OLED Displays & Display Replacement

Learning Outcomes

After completing this class, students will be able to:

- Identify different mobile display technologies.
 - Explain touchscreen functionality.
 - Replace damaged smartphone displays.
 - Apply screen adhesive correctly.
 - Test display functionality after replacement.
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8.1 Mobile Display Technologies

The display is the primary output device of a smartphone.

LCD (Liquid Crystal Display)

Characteristics

- Lower manufacturing cost
 - Good brightness
 - Lower contrast than OLED
 - Requires backlight
 - Common in budget smartphones
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OLED (Organic Light Emitting Diode)

Characteristics

- Self-illuminating pixels
 - Higher contrast ratio
 - Better color accuracy
 - Lower power consumption for dark themes
 - Common in premium smartphones
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AMOLED & Super AMOLED

Features

- Enhanced brightness
- Improved color reproduction
- Faster response time

- Better outdoor visibility
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8.2 Touch Screen

Modern smartphones use **capacitive touchscreens**.

Functions

- Detect finger touch
 - Multi-touch gestures
 - Swipe and pinch-to-zoom
 - Gesture navigation
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8.3 Display Assembly

A typical display assembly includes:

- Front Glass
 - Touch Digitizer
 - LCD/OLED Panel
 - Display Flex Cable
 - Frame (on some models)
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8.4 Display Replacement Procedure

Steps

1. Power off the phone.
2. Remove the SIM tray.
3. Heat the display edges to soften adhesive.
4. Separate the display using a suction cup and plastic picks.
5. Disconnect the display flex cable.
6. Clean old adhesive from the frame.
7. Install the new display.
8. Connect the flex cable.
9. Test the display before sealing.
10. Apply new display adhesive.
11. Reassemble the phone.

8.5 Screen Adhesive

Types

- Double-sided adhesive tape
- Liquid adhesive (B-7000/T-7000)
- Factory waterproof adhesive

Best Practices

- Clean surfaces before applying adhesive.
- Apply evenly.
- Avoid excess adhesive.
- Allow sufficient curing time if required.

Practical Exercise

Students will:

- Remove a damaged display.
- Clean the phone frame.
- Install a replacement display.
- Apply new adhesive.
- Test display brightness, colors, and touch functionality.

Assignment

Compare LCD, OLED, and AMOLED display technologies, highlighting their advantages and disadvantages.

Class 9 (2 Hours)

Battery Technology & Battery Replacement

Learning Outcomes

Students will be able to:

- Explain smartphone battery technology.
 - Evaluate battery health.
 - Replace batteries safely.
 - Understand basic charging IC functions.
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9.1 Battery Technology

Most smartphones use:

- Lithium-Ion (Li-ion)
- Lithium-Polymer (Li-Po)

Advantages

- Rechargeable
 - High energy density
 - Lightweight
 - Low self-discharge
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9.2 Battery Specifications

Important battery information includes:

- Capacity (mAh)
 - Voltage (V)
 - Watt-hour (Wh)
 - Charging cycles
 - Manufacturing date
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9.3 Battery Health

Battery health decreases with:

- Frequent charging cycles

- Overheating
- Overcharging
- Physical damage
- Aging

Symptoms of Battery Failure

- Rapid battery drain
 - Swollen battery
 - Unexpected shutdowns
 - Slow charging
 - Device overheating
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9.4 Battery Replacement Procedure

Steps

1. Power off the phone.
 2. Disconnect the battery.
 3. Remove battery adhesive.
 4. Lift the battery carefully.
 5. Install the new battery.
 6. Connect the battery flex cable.
 7. Reassemble the phone.
 8. Verify charging and battery health.
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9.5 Charging IC Basics

The Charging IC manages:

- Battery charging
- Power distribution
- Voltage regulation
- Battery protection

Common Symptoms of Charging IC Failure

- No charging
- Slow charging
- Battery overheating
- Charging interruption

Practical Exercise

Students will:

- Inspect battery health.
- Replace a smartphone battery.
- Verify charging functionality.
- Measure battery voltage using a multimeter.

Assignment

Explain proper handling and disposal procedures for damaged lithium batteries.

Class 10 (2 Hours)

Charging Port & USB Connectors

Learning Outcomes

Students will be able to:

- Identify charging connector types.
 - Diagnose charging problems.
 - Replace charging ports.
 - Test charging functionality after repair.
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10.1 Charging Port

The charging port is used for:

- Battery charging
- Data transfer
- Device communication
- OTG (On-The-Go) support

10.2 USB Type-C

Features

- Reversible connector
- Fast charging support
- High-speed data transfer
- Audio support (device dependent)

10.3 Lightning Connector

Features

- Used on Apple iPhones
- Reversible design
- Charging and data transfer
- Supports accessories

10.4 Common Charging Problems

- Loose charging port
- Broken connector pins
- Dirt or debris
- Corrosion
- Damaged charging flex cable
- Faulty charging IC

10.5 Charging Port Replacement

Steps

1. Open the phone.
2. Remove the charging board.
3. Disconnect flex cables.
4. Replace the charging port or charging board.
5. Reconnect components.

6. Test charging.
 7. Reassemble the phone.
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Practical Exercise

Students will:

- Inspect charging ports.
 - Clean charging connectors.
 - Replace a charging port assembly.
 - Verify charging speed and USB data transfer.
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Assignment

List common charging problems and describe troubleshooting methods for each.

Class 11 (2 Hours)

Camera, Audio & Biometric Components

Learning Outcomes

Students will be able to:

- Identify smartphone camera modules.
 - Replace speakers and microphones.
 - Replace vibration motors.
 - Replace fingerprint sensors.
 - Perform post-repair testing.
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11.1 Camera Modules

Types

- Rear Camera
- Front Camera
- Ultra-Wide Camera
- Macro Camera
- Telephoto Camera

Common Problems

- Blurry images
 - Camera not detected
 - Autofocus failure
 - Flash failure
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11.2 Speaker

Functions

- Loudspeaker output
- Music playback
- Speakerphone calls
- Notifications

Common Issues

- Low volume
 - Distorted sound
 - No audio output
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11.3 Receiver (Earpiece)

The receiver is used for voice calls.

Symptoms of Failure

- Low call volume
 - No sound during calls
 - Distorted voice
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11.4 Microphone

Functions

- Voice recording
- Phone calls
- Video recording
- Voice assistant

Common Problems

- Low recording volume
 - No audio input
 - Distorted recordings
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11.5 Vibrator Motor

Provides vibration feedback for:

- Calls
 - Notifications
 - Haptic feedback
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11.6 Fingerprint Sensor

Functions

- Device unlocking
 - Secure authentication
 - App authorization
 - Mobile payment authentication
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11.7 Component Replacement Procedure

General Steps

1. Open the smartphone.
2. Disconnect the battery.
3. Remove the faulty module.
4. Install the replacement component.
5. Reconnect all flex cables.

6. Reassemble the device.
 7. Test functionality.
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Practical Exercise

Students will:

- Replace a camera module.
 - Replace a loudspeaker or receiver.
 - Replace a microphone.
 - Replace a vibration motor.
 - Replace a fingerprint sensor.
 - Verify all replaced components through functional testing.
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Software & Tools Used

- Precision Screwdriver Set
 - Plastic Opening Picks
 - Tweezers
 - Suction Cup
 - Digital Multimeter
 - DC Power Supply
 - Digital Microscope
 - Hot Air Rework Station (if required)
 - Soldering Station (for advanced repairs)
 - ESD Wrist Strap
 - Isopropyl Alcohol (90%+)
 - Display Adhesive
 - Battery Adhesive Strips
 - Magnetic Screw Mat
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Practical Projects

- LCD/OLED Display Replacement
- Battery Health Testing & Battery Replacement
- Charging Port Replacement
- Camera Module Replacement
- Speaker & Receiver Replacement

- Microphone Replacement
- Vibrator Motor Replacement
- Fingerprint Sensor Replacement
- Complete Functional Testing After Repair

Module Assessment

Assessment	Marks
Quiz	10
Practical Exercises	30
Component Replacement Project	30
Functional Testing & Quality Inspection	20
Viva	10
Total	100

Module Learning Outcomes

After successfully completing **Module 3: Mobile Components & Replacement**, students will be able to:

- Identify and compare LCD, OLED, AMOLED, and touchscreen technologies.
- Safely replace smartphone displays using appropriate adhesives and installation techniques.
- Evaluate battery health, replace batteries, and understand the role of charging ICs in power management.
- Diagnose and repair charging-related faults by replacing charging ports and testing USB functionality.
- Replace camera modules, speakers, receivers, microphones, vibration motors, and fingerprint sensors using professional repair procedures.
- Perform complete post-repair functional testing to verify display, charging, audio, camera, biometric, and overall device performance.
- Apply industry-standard safety, ESD protection, and quality assurance practices throughout mobile hardware component replacement and repair.