

# **Syllabus: Advance Mobile Repair Training**

## **Course 1**

### **Basic Mobile Service M1: 45 Hrs.**

- Introduction To Mobile Communication
- History of mobile communication
- GSM (Global System For Mobile Communication)
- GSM & CDMA – Different bands
- Duplexing – Uplink & Down Link Frequencies.
- 3G Network – WCDMA & CDMA 2000, 4G networking Multiplexing methods (Cellular Communication)
- SDMA – Space Division Multiple Access \_Cell Concept
- FDMA – Frequency Division Multiple Access – Channels
- TDMA – Time Division Multiple Access (Time Sharing)
- CDMA – Code Division Multiple Access – spread spectrum method
- Advantages And Disadvantages Of Cell Concept Networking (GSM CDMA & WCDMA)
- Network Components – BTS, BSC, MSC, Link Towers – Repeaters
- BTS – Base Transceiver Station, BSC – Base Station Controller
- HLR, VLR, EIR, SMSC, AUC, Voice Message Centre
- Antenna – Low Power, High Power, Coverage, Repeater, Microwave Links
- Power Variation in Antenna for Different Bands.
- Auto Power Controlling In Mobile Phone According To Distance from BTS
- Mobile initiated call – key of security – Diagram
- Communication (link) between the cellular network and other networks
- Cell Broadcasting (CB), Cell Info Display Introduction To Mobile Phone
- Mobile Phone – IMEI Number
- Manufacturing Companies and Mutual Understanding With Network Providers.
- N/W Service Provider, N/W Technology Provider.
- Transmitting Power Of Mobile Phone – GSM & CDMA
- MS – Mobile Station – Mobile Phone + SIM
- Securities Used In Mobile Phone For User [Security Code, Keypad Lock, Call Barring, Pattern lock],
- Mobile phone pricing. SIM – Subscriber Identity Module
- SIM – block diagram
- SIM Contents, SIM Capacity, IMSI, PIN, PUK, Multi-SIM packages
- Working Voltage and clock for SIM. Features Provided By N/W Provider
- SMS, MMS, Voice Message, Call Barring, Call Diverting, Call Waiting, Call Conferencing, Fixed Dialing, CUG, etc.
- GPRS, EDGE, HSCSD, GPS Navigation Services, Television channels, Mobile Banking, Tablet PC services different Modes Of Operations & Battery
- Watchdog – Purpose
- Need Of Current Measurement In-Service Field.
- Main battery and RTC backup battery.
- Sensing Points In Battery [Temperature, Over Voltage Etc.] & Complaints
- Original And Duplicated Battery Comparison And Complaint Due To Duplicate Battery Different Types Chargers
- Types of chargers- travel, USB, Ampere rating of chargers
- Minimum Voltage For Charging, New Battery Charging
- Battery Low Indication, Battery boosting, Cut off Circuit Using In Battery SMT & SOC Systems – Revision
- Current consumption, Temperature Handling, Soldering Details

- MCP – (multi-chip packages), Modules, BGA – Ball Grid Array, POP
- Types Of BGA – Temperature Ratings
- Multi-Layer PCB's Integrated Circuits
- DC to DC Converters, N/W IC's, Microprocessor, Memory IC's, sensors, Filters, MCP, MML
- Bluetooth, Wi-Fi, FM IC's, SIM, SIM EMIF (Glass IC-Diode Array, Resistor Array)
- Pin Configuration of SMD IC's BGA
- Types of BGA, Pin Configuration of BGA IC's
- Points Remember While Handling BGA
- POP – Package On Package Hardware Of Mobile Phones
- Simple block diagram of mobile phone
- Detailed block diagram
- SOC(System on chip), Embedded System
- Power Supply Section, N/W Section, Data Processing Section
- Display Section, UI Section (User interface Section)
- Audio Section- Mic speaker, ringer, vibrator
- Other wireless sections
- Sensors in mobile phone
- AC & DC voltage source
- Measuring instruments, Multimeter
- Ohm's Law –simple Calculations
- Voltage, Current, Resistance, Power Relations
- Voltage & Current Measurement (breadboard)
- Electronic Components
- Passive & Active Components
- SMT, SMD
- SMT- advantages
- Resistors
- Fixed –types, Specifications
- Variable –types
- Array
- Color coding
- TDR (Thermistor) ,LDR ,VDR
- SMT resistors and Parallel & Series resistors
- Current ,voltage measurement
- Capacitors
- Capacitance, Capacitor value
- Capacitive Reactance
- Specifications of Capacitor
- Parallel & Series -coupling, filtering, bypassing
- Fixed –Ceramic Capacitor, Mica Capacitor
- Polyester Capacitor, Paper Capacitor
- Electrolytic Capacitor (Aluminium, Tantalum)
- Variable – types
- SMT capacitors -Applications in Laptop (tank capacitor, EMIF, Sensor)
- Dummy capacitors
- Components checking using a multimeter
- Inductors
- Inductance, Inductive reactance
- Self-inductance & mutual inductance
- Inductor- types (application base only)
- Comparison between Capacitors & Inductors
- Transformers, Specification
- Step up Transformers, step down Transformers, Tapped Transformers
- AC, chokes. Filters

## Course 2

### Basic Electronics M2: 30 Hrs

- Introduction to Electronics
- Application of Electronics
- Concept of matter
- Atomic structure
- Conductor, Semi- conductor, Insulator
- Electric charge, Potential difference, Electric current, Electrical energy, Electrical power
- Resistance
- Measuring units
- Types of current
- Direct current, Alternating current
- Wave length, Cycle, Frequency, Amplitude
- Voltage Sources
- AC & DC voltage source
- Measuring instruments, Multimeter
- Ohm's Law –simple Calculations
- Voltage, Current, Resistance, Power Relations
- Voltage & Current Measurement (breadboard)
- Electronic Components
- Passive & Active Components
- SMT, SMD
- SMT- advantages
- Resistors
- Fixed –types, Specifications
- Variable –types
- Array
- Color coding
- TDR (Thermistor) ,LDR ,VDR
- SMT resistors and Parallel & Series resistors
- Current ,voltage measurement
- Capacitors
- Capacitance, Capacitor value
- Capacitive Reactance
- Specifications of Capacitor
- Parallel & Series -coupling, filtering, bypassing
- Fixed –Ceramic Capacitor, Mica Capacitor
- Polyester Capacitor, Paper Capacitor
- Electrolytic Capacitor (Aluminium, Tantalum)
- Variable – types
- SMT capacitors -Applications in Laptop (tank capacitor, EMIF, Sensor)
- Dummy capacitors
- Components checking using a multimeter
- Inductors
- Inductance, Inductive reactance
- Self-inductance & mutual inductance
- Inductor- types (application base only)
- Comparison between Capacitors & Inductors
- Transformers, Specification
- Step up Transformers, step down Transformers, Tapped Transformers
- AC, chokes. Filters

- SMT inductor and applications
- Checking using Multimeter
- Filters Semi-Conductors
- N-Type & P-Type Semi-Conductors
- P-N junction, Biasing
- Semiconductor Diodes
- Diode – working, Specification
- Classification of Diodes
- Zener diode Voltage Regulator
- SMT diodes and applications
- Checking using Multimeter
- Checking using by component Tester
- DC Voltage source
- Cell
- Primary & secondary cell
- Voltage & current rating of Cell
- Combination of cell
- Battery- Series, & Parallel
- Back up time & Charging time
- Battery boosting
- Battery
- Battery -PPT
- Types Of Battery, NiMH – NiCd, Li-Ion, Li-Polymer, Poly a scene.
- Li-Ion & Li-Polymer – Protection Circuit
- Advantages and Disadvantages.
- AC to DC converter
- Rectifiers & filters
- Different types of Rectifiers (Half wave & Full wave)
- Applications Transistor
- NPN & PNP Transistor
- Transistor as a switch
- Transistor as Amplifier
- Different types of amplifiers – AF, RF, IF
- Voltage amplifiers(pre-amp) and Power amplifiers
- Multistage amplifiers (Ex: PA)
- Tuned amplifiers
- Comparison – FET, JFET & MOSFET
- Advantages &disadvantages
- SMT transistor introduction and application
- Checking using Multimeter integrated circuit

- Classification of IC, Advantages of IC
- IC package – (PPT)
- SOC, Multi-chip package
- Components array
- Digital electronics
- Introduction (comparison between analog & digital)
- Logic gates
- AND, OR, NOT
- Flip- Flop, Multiplexers, De multiplexers
- Memory- Classification
- RAM, ROM, EEPROM
- Flash Memory, OTP

### Course 3

#### Circuit/Schematic Analysis M3: 30Hrs

- Charging section(all models)
- Components Used In charging Section, Charging indication, charging controlling
- Temperature sensing, BSI
- Energy management IC
- USB charging
- Power management section
- Power saving mode in mobile phone.
- Components Used In Power Section
- Power distribution, Core Voltages
- AC-DC converters(SMPS IC), regulators
- Block diagram of UEM, RETU, AVILMA, and others
- Temperature, Over Voltage, and Low – Voltage Cutoff For Battery.
- BSI, B-Temp Circuit on Board, Sensing Point Complaints
- current sensing resistor
- Pull up and pull down resistor
- On-Off Section Working (different models such as Nokia, Samsung, Sony Ericsson..))
- Complaints Due To On-Off Circuit
- RTC & Backup Battery
- External Power Supply to Mobile Phone – Sensing Circuit
- Tracing and Voltage checking

- Complaints in charging and power sections
- Block Diagram of Data Processing Section
- CPU – Single engine, Dual engine
- Different Processors – Samsung, Sony, iPhone, oppo
- Single and Dual Operating Systems
- Clock Signal For CPU – main crystal and RTC, CPU Speed
- Core voltage supply
- DSP – Digital Signal Processor, Block Diagram Of Digital Modulation
- Memory section
- RAM ,ROM,E2prom and Flash - common Complaints
- MCP (multi-chip packages) or MML (merged memory logic) or Combo memory.
- Memory capacity checking from serial number
- Internal mass Storage, Extended memory (Memory card section)
- SIM section -SIM Related H/W Complaints, SIM Related Error Messages.Mobile Software's
- System Software (Operating System) – Types of operating systems
- Dual engine operating systems (System OS + Application OS)
- API (Application Peripheral Interfere), Domestic OS (does not support API)
- Data Exchange Software (PC suites)Mobile phone software upgrading
- Service Software's – Unlocking / Repairing
- Flashing – different methods, Flashing Boxes & Dongles,
- Tracing and Voltage checking
- Error Messages For H/W Complaints While Using Boxes
- Network Section
- Block Diagram explanation, a Basic block diagram
- RF Section and IF Section
- Antenna , External Antenna, Antenna Switch (Tx / Rx),FEM
- Pre-Amplifiers & RF Power Amplifier (TX)
- LNA – RF Amplifiers, RF Signal Processor
- VCO, Supply To VCO
- Crystal Oscillator, Frequency Synthesizer – working
- Crystal, Coil Filters, Mutual Couplers(RF transformers)
- Tracing and Voltage checking
- Common Complaints
- Audio Section
- Explanation Of Audio Section In Different Models – Audio IC
- MIC – Types, Crystal & Digital mic
- Noise cancellation & multimedia mic
- Speaker, Ringer, Vibrator, Audio amplifiers (ICs), Hands-free – Types – WorkingDisplay Section
- Liquid Crystal Display – LCD Drivers, LCD Connectors
- Organic Led (O Led), examples
- Touchpad- types of the touchpad(resistive, capacitive), Multy touch
- Backlight driver circuit in different models
- Backlight brightness controlling (ambient light sensor)
- Tracing and Voltage checking
- Common compliant keypad Section
- Keypad, Backlight
- Flip Keypad Activation
- Joystick, Trackball, Touch Sensitive Keypad, optical touchpad
- Camera Section
- Camera –types, camera working voltages
- The resolution, digital &optical zooming
- Camera flashlight driver circuit
- Sensors
- Hardware details
- Tracing and Voltage checking
- Common complaints advanced Technologies In Mobile Communication
- Convergent technology – TV, Projector, internet, GPS .....

- GPRS EDGE ,HSCSD,3G
- Bluetooth, Wi-Fi, DLNA, Wi-Max
- Wi-Fi hot spot in mobile phone
- GPS & Navigation on Mobile phone
- Short-range wireless sections in mobile phone -Hardware details
- FM, Wi-Fi, Blue tooth, GPS
- iPhone, Blackberry
- HTC, SONY
- Dead set repairing procedure
- Data backup and recovery method

#### **Course 4**

##### **IC Rebellig M4: 25 Hrs.**

- Checking Cell phone Schematic through advanced tools and software
- EMMC programming
- iPad iCloud Erasing
- Pad layout

