

## **INVERTERS, AVR AND POWER ELECTRONIC REPAIRS TOPICS TO BE COVERED IN THE CURRICULUM, ORGANIZED MODULE BY MODULE**

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### **MODULE 1: Electrical & Electronics Fundamentals**

- Electrical safety & workshop practice
  - AC principles
  - DC principles
  - AC vs DC comparison
  - Ohm's Law
  - Electrical power
  - Electrical energy
  - Passive components
    - Resistors
    - Capacitors
    - Inductors
  - Active components
    - Diodes
    - Bipolar Junction Transistors (BJTs)
    - MOSFETs
    - IGBTs
  - Reading and interpreting circuit diagrams
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### **MODULE 2: Power Electronics Devices & Circuits**

- Rectifier circuits
  - Half-wave rectifiers
  - Full-wave rectifiers
  - Bridge rectifiers
- DC–DC converters
  - Buck converters
  - Boost converters
- Pulse Width Modulation (PWM) concepts
- Switching losses
- Heat management in power electronics
- Snubber circuits
- Gate driving fundamentals

## **MODULE 3: SMPS & Charger Repair**

- SMPS block diagrams
  - SMPS operating principles
  - Flyback converter topology
  - Forward converter topology
  - Push-pull converter topology
  - Feedback circuits
  - Regulation circuits
  - Battery charging algorithms
  - Common SMPS faults and failures
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## **MODULE 4: Inverter Systems (Home & Solar)**

- Inverter classifications
    - Square wave inverters
    - Modified sine wave inverters
    - Pure sine wave inverters
  - H-bridge operation
  - Low-frequency inverter design
  - High-frequency inverter design
  - Battery banks
  - Battery Management Systems (BMS)
  - Solar inverter architecture
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## **MODULE 5: Advanced Inverter Fault Diagnosis**

- Inverter error codes
- Overload protection
- Short-circuit protection
- Over-voltage protection
- Microcontroller-based inverter control systems
- Gate drive failure analysis
- Feedback loop troubleshooting
- Thermal fault analysis
- Firmware-related inverter faults

## **MODULE 6: Industrial & Commercial Inverters and AVR**

- Uninterruptible Power Supply (UPS) systems
  - Variable Frequency Drives (VFD) basics
  - Automatic Voltage regulators (AVR)
  - Motor drive fundamentals
  - Three-phase inverter concepts
  - Power Factor Correction (PFC)
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## **MODULE 7: Workshop Practice & Entrepreneurship**

- Customer fault reporting procedures
  - Cost estimation
  - Repair quotations
  - Spare parts sourcing
  - Inverter repair workshop setup
  - Ethics in technical practice
  - Professional conduct
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