

GOVERNMENT OF THE PUNJAB
TECHNICAL EDUCATION & VOCATIONAL
TRAINING AUTHORITY



CURRICULUM FOR
ELECTRONICS EQUIPMENT REPAIR
(6 – Months Course)

CURRICULUM SECTION
ACADEMICS DEPARTMENT

96-H, GULBERG-II, LAHORE
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TRAINING OBJECTIVES

Industrial development is rapidly increasing with the qualitative products to meet the public requirements. There, the trained & skillful persons play a vital role in the modern life because of technological development.

This curriculum of six months duration is developed keeping in view the local job market demand by more focusing on practical training along with necessarily required theoretical knowledge.

This curriculum covers the major topics of common hand tools , electricity, basics of Electronics, Regulated power supply, Amplifiers, Oscillators, Assembling electronics circuits using both integrated and discrete components such as., Radio receivers, Power supplies etc. Radio receiver , Black and white T.V.Colored TV, Remote Control, Computer monitor in order to produce the skillful and capable workforce to meet the present & future demands of the job market along with ethical values.

CURRICULUM SALIENTS:

| | |
|-----------------------|------------------------|
| Entry level | Matric |
| Duration of Course | 6– Months |
| Total Training Hours | 800 Hours |
| | 40 Hours per week |
| | 6 days per week |
| | 7 Hours per day except |
| | Friday 5 Hours |
| Training Methodology | Practical 90% |
| | Theory 10% |
| Medium of Instruction | English / Urdu |

SKILL PROFICIENCY DETAILS:

On successful completion of this course , the trainee should be able to:

1. Apply the safety rules while dealing with electrical circuits and prevent electric shock.
2. Use the measuring and testing equipment safely and accurately.
3. Make the soldering joints expertly.
4. Assemble the following electronic circuits:
 - a. Variable voltage regulated power supply using IC circuit.
 - b. Amplifier using integrated / discrete components.
 - c. AM / radios
5. Find the faults in radios and tape recorders.
6. Remove the faults in radios and tape recorders.
7. Diagnose & remove the faults in TV (Both colored and Black & White).
8. Replace the defective components/parts.
9. Repair the TV monitor & Remote Control sets.

KNOWLEDGE PROFICIENCY DETAILS:

On successful completion of this course, the trainee should be able to:

1. Express the safety precautions for working with electrical power supply / electrical components.
2. Define the use, care and maintenance of electronics technician's tools and measuring cum testing equipment.
3. Explain the electricity theory, AC and DC, electromagnetism, Ohm's law, units of electricity , electrical symbols
4. Describe the electrical circuits and their properties
 - a. Capacitor
 - b. Resistor
 - c. Inductor
 - d. Transformer
 - e. Describe the basic electronics -theory, symbols, characteristics and working principles of the following:
 - i. Semi conductors
 - ii. Rectifier circuits
 - iii. Transistor
 - iv. Amplifiers
 - v. Integrated circuits
 - vi. Oscillator
 - vii. Regulator
 - viii. Converters
5. Describe the principles of radio receivers AM & FM.
6. Describe the principles of magnetic tape recording / reproducing.
7. Explain the basic working principle of television.
8. Explain the fault finding and trouble shooting techniques in radio, TV (both colored and Black & White)

CURRICULUM DELIVERY STRUCTURE

| | Curriculum Delivery | Revision | Co-curricula Activities | Final Test | Total |
|----------------------------|----------------------------|-----------------|--------------------------------|-------------------|--------------|
| W E E K | 1-20 | 21 | 22-25 | 26 | 26 |
| | 20 | 1 | 4 | 1 | |

SCHEME OF STUDIES

Electronics Equipment Repair

(6-Months Course)

| Sr. No. | Main Topics | Theory Hours | Practical Hours | Total Hours |
|----------------|--|---------------------|------------------------|--------------------|
| 1. | Fundamental of Electricity | 10 | 80 | 90 |
| 2. | Basic Electronics | 10 | 80 | 90 |
| 3. | Radio | 8 | 60 | 68 |
| 4. | Tape recorder/ Local deck | 10 | 60 | 70 |
| 5. | Television B & W and introduction of color TV receiver | 22 | 400 | 422 |
| 6. | Functional English | 20 | 20 | 40 |
| 7. | Work Ethics | 0 | 20 | 20 |
| Total | | 80 | 720 | 800 |

DETAIL OF COURSE CONTENTS
Electronics Equipment Repair
 (6 – Months Course)

| Sr. No. | Detail of Topics | Theory Hours |
|-----------|---|--------------|
| 1. | Fundamentals of Electricity | |
| | 1.1 Introduction | ½ |
| | 1.1.1 Introduction of electricity & electronics | |
| | 1.1.2 Application of electricity & electronics | |
| | 1.1.3 Units of electrical and electronics | |
| | 1.2 Measuring Instruments | ½ |
| | 1.2.1 Introduction to various Instruments | |
| | 1.2.2 Multi-meter | |
| | 1.2.3 Signal Generator | |
| | 1.2.4 Oscilloscope | |
| | 1.3 Conductor & Insulator | ½ |
| | 1.3.1 Definition of Conductor & Insulator | |
| | 1.3.2 Types of conductor & insulator | |
| | 1.4 Resistance & Conductance | ½ |
| | 1.4.1 Definition of resistance | |
| | 1.4.2 Resistance dependent material | |
| | 1.4.3 Unit of resistance | |
| | 1.4.4 Color decoding of resistance | |
| | 1.4.5 Types of resistance | |
| | 1.4.6 Definition of conductance | |
| | 1.4.7 Unit of conductance | |
| | 1.5 Ohms Law | 1 |
| | 1.5.1 Definitions of ohms law | |
| | 1.5.2 Mathematical formula | |
| | 1.5.3 Calculations on Ohm's law | |
| | 1.6 Series Circuits | 1 |
| | 1.6.1 Resistors in series | |

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|--|---|---|
| | 1.6.2 Current in series circuit | |
| | 1.6.3 Total series resistance | |
| | 1.6.4 Voltage dividers | |
| | 1.6.5 Application of series circuit | |
| | 1.7 Parallel Circuits | |
| | 1.7.1 Resistors in parallel | 1 |
| | 1.7.2 Voltage in parallel circuit | |
| | 1.7.3 Total parallel resistance | |
| | 1.7.4 The current dividers principle | |
| | 1.7.5 Application of parallel circuit | |
| | 1.8 Electricity & Magnetism | 1 |
| | 1.8.1 The magnetic field | |
| | 1.8.2 Electromagnetism | |
| | 1.8.3 Electromagnetic induction | |
| | 1.8.4 Applications of electromagnetic induction | |
| | 1.9 Capacitors | |
| | 1.9.1 The capacitors | 1 |
| | 1.9.2 Types of capacitors | |
| | 1.9.3 Capacitors in Series | |
| | 1.9.4 Capacitors in Parallel | |
| | 1.9.5 Capacitors applications | |
| | 1.9.6 Testing of capacitors | |
| | 1.10 Inductors | |
| | 1.10.1 The inductors | 1 |
| | 1.10.2 Types of inductors | |
| | 1.10.3 Inductors in Series | |
| | 1.10.4 Inductors in Parallel | |
| | 1.10.5 Inductors in ac circuits | |
| | 1.10.6 Inductors applications | |
| | 1.10.7 Testing of inductors | |
| | 1.11 Transformers | 1 |
| | 1.11.1 The basic transformer | |

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|-----------|--|--|
| | <p>1.11.2 Step-up transformers 1.11.3 Step-down transformers 1.11.4 Other types of transformers 1.12 RLC in series and parallel circuit 1.12.1 Sinusoidal response of RC, RL RLC circuits</p> | 1 |
| 2. | <p>Basic Electronics</p> <p>2.1. Electronics Components 2.1.1. Semiconductor Devices 2.1.2. Conduction in semiconductor materials 2.1.3. N type and P type semiconductors 2.1.4. PN junction 2.1.5. Biasing the diode 2.1.6. Diode characteristic</p> <p>2.2. Diode & Application 2.2.1. Half & Full Wave rectifier 2.2.2. Zener diode (as V-regulator) and data sheet 2.2.3. Consultation of data sheet (Diodes / transistors / ICs)</p> <p>2.3. Transistor 2.3.1. Transistor biasing 2.3.2. Transistor as Amplifier 2.3.3. Transistor as Switch</p> <p>2.4. Basic Configuration of a transistor 2.4.1. Common Emitter Amplifier 2.4.2. Common Collector Amplifier 2.4.3. Common Base Amplifier</p> <p>2.5. Power Amp 2.5.1. Push pull Amplifier 2.5.2. Complementary symmetry Amp 2.5.3. Integrated Amplifier 2.5.4. Applications</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> |

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|-----------|--|--|
| | <p>2.6. Power Amp Integrated</p> <p>2.6.1. Integrated Power amplifiers</p> <p>2.6.2. Applications</p> <p>2.7. Regulated Power Supply</p> <p>2.7.1. Transistorized regulated power supply (fixed)</p> <p>2.7.2. Transistorized regulated power supply (adjustable)</p> <p>2.8. Regulated Power supply</p> <p>2.8.1. Integrated Regulators</p> <p>2.9. Switch mode regulated power supply</p> <p>2.9.1. Basic principle of switch mode power supply</p> <p>2.9.2. Block diagram of switch mode power supply</p> <p>2.9.3. Application of switch mode power supply</p> | <p>1</p> <p>1</p> <p>1</p> <p>2</p> |
| 3. | <p>Radio</p> <p>3.1. Basic Principle of Oscillators</p> <p>3.1.1. Oscillators and its different types</p> <p>3.1.2. Applications</p> <p>3.2. Radio Theory</p> <p>3.2.1. Modulation Techniques</p> <p>3.2.2. Amplitude modulation</p> <p>3.2.3. Frequency modulation</p> <p>3.3. Super heterodyne radio receiver</p> <p>3.3.1. Block diagram of A.M. transmitter</p> <p>3.3.2. Block diagram of S.H. Receiver</p> <p>3.3.3. Heterodyning Action</p> <p>3.3.4. Intermediate Frequency Amplifier</p> <p>3.4. Demodulation</p> <p>3.4.1. AM Detector</p> <p>3.4.2. FM Discriminator</p> <p>3.5. Loud Speakers</p> <p>3.5.1. Construction &Types of loud speakers</p> | <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p> |

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| <p>4.</p> | <p>Tape Recorder/Local Deck</p> <p>4.1. Introduction</p> <p>4.1.1. Basic Principle of Tape recorder</p> <p>4.2. Magnetic Tape and Cassette Recorder</p> <p>4.2.1. Principle of magnetic tape</p> <p>4.2.2. Structure and function of play and erase head</p> <p>4.2.3. Magnetic recording method</p> <p>4.2.4. Method of head alignment</p> <p>4.3. Tape transport system / Mechanism</p> <p>4.3.1. Introduction to mechanical system of tape and cassette recorder</p> <p>4.3.2. Main and common parts of mechanical system</p> <p>4.3.3. Servicing technique</p> <p>4.3.4. Common problems in mechanical system</p> | <p>3</p> <p>3</p> <p>4</p> |
| <p>5.</p> | <p>Television B & W and introduction of Color TV receiver</p> <p>5.1. Black & White TV receiver</p> <p>5.1.1. Introduction to B & W TV receiver</p> <p>5.1.2. Explanation of Block circuit diagram</p> <p>5.1.3. Tuner</p> <p>5.1.4. Picture IF</p> <p>5.1.5. Video amplifier</p> <p>5.1.6. Sound IF amplifier</p> <p>5.1.7. FM demodulator</p> <p>5.1.8. AF out put</p> <p>5.1.9. Pulse separation</p> <p>5.1.10. Vertical deflection</p> <p>5.1.11. Horizontal deflection</p> <p>5.1.12. High voltage</p> <p>5.1.13. Television Picture</p> <p>5.1.14. Picture quality</p> | <p>1</p> |

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| 5.1.15. Scanning | |
| 5.1.16. Blanking, synchronizing pulses | |
| 5.2. Picture tube | 1 |
| 5.2.1. Picture tube specification | |
| 5.2.2. Mono chrome picture Troubles | |
| 5.2.3. Color picture tube | |
| 5.2.4. Types of color picture tube s | |
| 5.2.5. Common fault in color picture tube | |
| 5.3. Composite video signal | 1 |
| 5.3.1. Video signal demonstration by TV oscilloscope. | |
| 5.3.2. Horizontal blanking / sync composition' | |
| 5.3.3. Vertical blanking / sync composition | |
| 5.4. TV tuners | 1 |
| 5.4.1. Tuner operation | |
| 5.4.2. Types of Tuners | |
| 5.4.3. Common fault in tuner circuit | |
| 5.5. Video IF amplifier | 1 |
| 5.5.1. Video If section | |
| 5.5.2. Sync. separator | |
| 5.5.3. Common faults in VIF section | |
| 5.6. Sound system | 2 |
| 5.6.1. Sound IF amplifier | |
| 5.6.2. FM demodulator | |
| 5.6.3. AF amplifier | |
| 5.6.4. Common faults in sound circuit | |
| 5.7. Video detector and Video amplifier | 2 |
| 5.7.1. Video amplifier configuration | |
| 5.7.2. Video amplifier circuits | |
| 5.7.3. Common fault in video circuit | |
| 5.8. Vertical deflection section | 2 |

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| 5.8.1. | Vertical oscillator and function of V hold | |
| 5.8.2. | Vertical driver amplifier and function of controls | |
| 5.8.3. | V size, V center, V height | |
| 5.8.4. | Common faults in vertical circuits | |
| 5.8.5. | Horizontal deflection section | |
| 5.8.6. | Working principle of H Osc and AFC circuit | |
| 5.9. | Horizontal driver amplifier | 2 |
| 5.9.1. | Working principle of Horizontal out put circuit | |
| 5.9.2. | Horizontal out put transformer /Flyback | |
| 5.9.3. | Common faults in horizontal circuit | |
| 5.10. | Color TV Receiver | 3 |
| 5.10.1. | Explanation of colour circuit by block diagram | |
| 5.10.2. | Common faults in color TV receiver | |
| 5.11. | CPU Monitor | |
| 5.11.1. | Explanation by Block circuit diagram of monitor/display. | 3 |
| 5.11.2. | Common faults in CPU Monitor/ display | |
| 5.12. | Remote Control | 3 |
| 5.12.1. | Working principle of remote control | |
| 5.12.2. | Common faults in Remote control circuit | |
| Total | | 60 |

| Sr. No. | Detail of Contents | Practical Hours |
|---------|--|-----------------|
| 1. | <p>Fundamental of Electricity</p> <p>1.1. Safety when working on electrical / electronics devices</p> <p>1.2. Soldering practice</p> <p>1.3. Function and application of Multi -meter</p> <p>1.4. Measurement of current and voltage</p> <p>1.5. Verification of Ohm's Law</p> <p>1.6. Measuring resistance in series and parallel</p> <p>1.7. Study of types of Resistors, Capacitor & Inductors.</p> <p>1.8. Faults finding / rectification in resistors, Capacitors & Inductors.</p> <p>1.9. Study of different types of transformers.</p> <p>1.10. Practice of winding of a transformer.</p> <p>1.11. Study of Oscilloscope</p> <p>1.12. To measure peak, peak-to-peak AC voltage with oscilloscope.</p> <p>1.13. To measure Time period & Frequency of AC Signal</p> | 80 |
| 2. | <p>Basic Electronics</p> <p>2.1. Checking of Semi Conductor Components (diodes, Transistors & ICs).</p> <p>2.2. To construct half wave rectifier circuit and investigate half wave rectification with & without filter circuit.</p> <p>2.3. To construct full wave rectification (center tap) & investigate full wave rectification (center tap) with and without filter circuit.</p> <p>2.4. To construct full wave bridge rectifier circuit and investigate its rectification with & without filter circuit.</p> <p>2.5. Assembly of typical mains operated power supply with zener diode as regulator.</p> | 80 |

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| | <p>2.6. Fault finding & rectification in Power Supply circuit.</p> <p>2.7. Assembly of Audio amplifier using transistor.</p> <p>2.8. Fault finding & amplification in Audio amplifier.</p> <p>2.9. Assembly using 555 circuits timer</p> <p>2.10. Assembly of Power amplifier & amplification type</p> | |
| 3. | <p>Radio</p> <p>3.1. Stage by stage assembly of super-heterodyne A.M receiver.</p> <p>3.2. Turning of super heterodyne A.M receiver.</p> <p>3.3. Stage by stage fault finding & rectification in super heterodyne A.M receiver.</p> | 60 |
| 4. | <p>Tape Recorder / Local Deck</p> <p>4.1. Fault finding & rectification of tape recorder</p> <p>4.2. Fault finding & rectification of Car Deck (Mechanical as well as electronic circuits)</p> | 60 |
| 5. | <p>Television B & W and Introduction of Color TV Receiver</p> <p>5.1. Identification of different stages with the help of block diagram of following TV receivers: -</p> <p>5.1.1. Sony</p> <p>5.1.2. Philips</p> <p>5.1.3. L.G.</p> <p>5.2. Study of circuit diagram of the following TV receiver:</p> <p>5.2.1. Sony</p> <p>5.2.2. Philips</p> <p>5.2.3. L.G.</p> <p>5.3. Assembly of variable IC regulated Power Supply</p> <p>5.4. Fault finding in variable IC, regulator & Power Supply</p> <p>5.5. Measurement of voltages & study of wave shape of signals in Normal Condition</p> <p>5.6. Measurement of E.H.T voltage with the help of E.H.T probe</p> | 400 |

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| | <p>5.7. Fault finding and its rectification for the various symptoms in the following stages: -</p> <p>5.7.1. Power Supply (Low voltage)</p> <p>5.7.2. E.H.T.</p> <p>5.7.3. Horizontal deflection circuit</p> <p>5.7.4. Vertical deflection circuit</p> <p>5.7.5. Picture Tube</p> <p>5.7.6. Video Amplifier</p> <p>5.7.7. Video Detection</p> <p>5.7.8. Tuner & I.F</p> <p>5.7.9. Color Circuit</p> <p>5.8. Computer Monitor/Display</p> <p>5.8.1. Explanation of block diagram</p> <p>5.8.2. Common fault identification / rectification in Computer Monitor.</p> <p>5.9. Remote Control</p> <p>5.9.1. Working principle of remote control</p> <p>5.9.2. Common faults / rectification in remote control.</p> | |
| TOTAL | | 680 |

LIST OF MACHINERY / EQUIPMENT / TOOLS ETC

(For a class of 20 Students)

| | |
|---------------------------|------------------------------------|
| Name of Trade | Electronic Equipment Repair |
| Duration of Course | 6-Months |

| Sr. No. | Nomenclature of Tools & Equipment | Quantity |
|----------------|--|-----------------|
| 1. | Multi meters Analog | 10 Nos. |
| 2. | Multi meter Digital. | 10 Nos. |
| 3. | Digital L.C.R. meter | 2 Nos. |
| 4. | Function Generator. | 2 Nos. |
| 5. | Dual Regulated Power Supply 0 to 30 V 4 A each | 10 Nos. |
| 6. | Dual channel Oscilloscope 20 MHZ | 2 Nos. |
| 7. | Colors bar Patterns Generator with all running patterns with AV and RF out put | 2 Nos. |
| 8. | RF/AF signal Generator | 2 Nos. |
| 9. | High Voltage Probe | 1 No. |
| 10. | Electric Blower Japan/Korea | 1 No. |
| 11. | Electric Drill machine miniature | 4 Nos. |
| 12. | TV receiver & TV Monitor. | 10 Nos. |
| 13. | Over head projector | 1 No. |
| 14. | Soldering station | 5 Nos. |
| 15. | De-Soldering Station | 2 Nos. |
| 16. | Soldering Iron Goot /Well er | 20Nos. |
| 17. | Screw driver kit (set of 9 piece flat type) | 20Nos. |
| 18. | Junior Hack-Saw Frame. | 10 Nos. |
| 19. | Soldering Iron Stand | 20Nos. |
| 20. | Pliers Combination Side cutter, Long Nose, Flat insulation remover | 20Nos. |
| 21. | Tweezers (different sizes) | 20Nos. |
| 22. | Needle file set | 20Nos. |
| 23. | Steel foot rule | 20Nos. |
| 24. | Precision screw driver set (6 pieces) | 5 sets |
| 25. | Wire gauges | 5 Nos. |
| 26. | Screw driver kit (set of 9 piece Philips type) | 20Nos. |

FURNITURE

| S.# | Name of Articles | Quantity |
|------------|------------------------------------|-----------------|
| 1. | Working bench | 10 No's |
| 2. | Wooden stool (for students) | 20 No's |
| 3. | Chair for teacher | 02 No's |
| 4. | White board (3 ½ x 5ft) with stand | 01 No. |
| 5. | Steel Almirah (4 x 7 ft) | 04 No's |
| 6. | Instructor table with 3 drawers | 01 No. |

EMPLOYABILITY OF PASS-OUTS

The pass outs of this course may find job / employment opportunities in the following areas / sectors: -

1. Computer repairing shops
2. Electronic repairing shops.
3. Assembler / technician in electronic product companies.
4. Salesman/Technician in shops dealing with electronic equipment.

REFERENCE BOOKS

1. Basic electronics by Bernard Grob.
2. Digital electronics by Floyd.
3. Electronic equipment maintenance by Mc Graw Hills Series.

QUALIFICATION OF TEACHER

D.A.E in Electronics Technology with 2 years experience in the relevant field

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OR

Two Years certificate in Electronics Applications (G-II Level) with 6 years
experience in the relevant field.