Syllabus For Computer Chip Level Repair Technician

Course Name	Computer Chip Level Repair Technician
Sector	Electronics & Hardware
Course Code	ELE/2024/CCRT/419
Level	3
Occupation	Computer Chip Level Repair Technician
Job Description	The Computer Chip Level Repairing Technician is responsible for diagnosing, repairing and maintaining computer hardware at the chip level, including desktop computers and laptops. They utilize their expertise in identifying various types of integrated circuits (ICs) and chips commonly used in computer systems, employing soldering and desoldering techniques to remove and replace faulty components accurately. This role involves troubleshooting hardware issues, testing IC sockets and performing reballing and reflowing techniques to address soldering-related problems.
Course Duration	**Total Duration 390 Hrs (T-90, P-180, OJT-60 and ES-60)**
Trainees' Entry Qualification	Class XII passed out with science
Trainers Qualification	BE, B.Tech in Electrical/ Electronics/ Computer Science with 1 year experience in relevant field. OR Diploma in Electrical/ Electronics / Computer Sc. 2 years experience in relevant field. OR NTC/NAC in Electronics Mechanics/ Instrument Mechanics Trade with 3 years experience in relevant field.

Structure of Course:

Module No.	Module name	Outcome	Compulsory/ Elective	Theory (Hrs)	Practical (Hrs)	OJT (Hrs.)	Total (Hrs) [Multiple of 30]
1	**Basic Electronics**	Demonstrate various electronics components and test by using measuring instruments	Compulsory	20	40		60

Module No.	Module name	Outcome	Compulsory/ Elective	Theory (Hrs)	Practical (Hrs)	OJT (Hrs.)	Total (Hrs) [Multiple of 30]
2	**Chip level practice with testing and repairing tools**	Test and troubleshoot all types of IC and chip for desktop computer and laptop.	Compulsory	10	20		30
3	**Circuit tracing and repairing of motherboard**	Diagnose and test all types of Motherboard	Compulsory	20	40		60
4	**Circuit tracing and repairing of laptop and desktop computers**	Assemble and repair desktop, laptop and its hardware components	Compulsory	20	40		60
5	**Safety, Hygiene and cleanliness**	Maintain personal hygiene, cleanliness and safety at the workplace.	Compulsory	20	40		60
6	**OJT**	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	Compulsory	-	-	60	60
7	**Employability Skill**	As per guided curriculum	Compulsory	60	-	-	60
		TOTAL		**150**	**180**	**60**	**390**

SYLLABUS:

Module 1: Basic Electronics

Outcome: Demonstrate various electronics components and test by using measuring instruments

Theory Content:

- Basic Electronics Concept, Formation of Current, AC/DC Concept, Rules for Flow of Current.
- Resistor- Symbol, Function, Function, Denoting Letter, Solid Type Resistor Color Coding, SMD Type Resistor Coding, Value measurement by Multimeter and SMD Tester.
- Capacitor – Function, Types, Symbol, Identification of Solid Type and SMD Type Capacitor, Testing of Capacitor by Multimeter and SMD Tester, Value measurement by SMD Tester.
- Coil – Function, Symbol, Denoting Letter, Types of material, Properties of Coil, Identification of Solid and SMD type coil, Pack coil, Testing of Coil.
- Diode: Function, Symbol, Denoting letter, Identification of Solid and SMD Type Diode, Types of Diode, Testing of Diode, Anode and Cathode Concept

- Transistor: Introduction, Types, Symbol, Denoting Letter, PNP and NPN Concept, Testing of Transistor, Function etc.

- MOSFET: Introduction, Types, 3 leg MOSFET, 8 Leg MOSFET, Identification of N-Channel and P-Channel MOSFET, Testing of MOSFET, Dual MOSFET Concept, Switching Concept Etc.

- Crystal: Introduction, Concept of Quartz, Clock and Pulse, Measuring unit, Types and Real Shape, Testing of Crystal etc.
- Transformer and IC.

Practical Content:

- Demonstrate the concepts of current flow using simple circuit setups with batteries, switches and bulbs
- Conduct experiments for testing of Diode, Anode and Cathode concept
- Testing of Transistor and its Function
- Conduct practical exercises on decoding color bands on soild type resistors and SMD type resistors
- Measure the resistor values by using multimeters and SMD testers.
- Identify solid type and SMD type capacitors based on marking and appearance
- Test MOSFET, Dual MOSFET Concept, Switching Concept Etc.
- Explain the role of crystals in generating clock and pulse signals
- Demonstrate transformer operation in stepping up/down voltage and isolating circuits

Module 2: Chip level practice with testing and repairing tools

Outcome: Test and troubleshoot all types of IC and chip for desktop computer and laptop.

Theory Content:

- Introduction to ICs and Chips
- Functionality and role of ICs and Chips
- Identification of ICs and chips
- Overview of common issues encountered with ICs and chips in desktop and laptops
- Concept of Soldering Iron, Micro Soldering Iron.
- Desoldering Pump, File, Twiser, SMD Machine and Hot Melt Gun.
- All types of IC and Chip soldering/ Desoldering.
- All types of Electronic Component Solid and SMD soldering /Desoldering**.**
- Troubleshooting methodologies for diagnosing issues related to ICs and chips
- Tools and equipment's required for testing ICs and chips such as multimeters, oscilloscopes, logic analyzers and IC testers

Practical Content:

- Identify different types of ICs and chips used in desktop computers and laptops
- Demonstrate removing and replacing ICs and chips on desktop computer motherboards and laptop circuit boards
- Test IC sockets for proper connectivity and functionality
- Demonstrate IC reballing and reflowing techniques to repair soldering related issues in desktop computer and laptops

- Demonstrate use of Soldering Iron, Micro Soldering Iron.
- Show the proper technique for Desoldering Pump, File, Twiser, SMD Machine and Hot Melt Gun.
- Setup and calibrate all types of IC and Chip soldering/ Desoldering.
- Demonstrate use of all types of Electronic Component Solid and SMD soldering /Desoldering.

Module No. 3: Circuit tracing and repairing of motherboard

Outcome: Diagnose and test all types of Motherboard

Theory Content:

- Motherboard overview and Block Diagram of Motherboard.
- Identification of all types of chip, ports, socket, slots etc in Motherboard.
- Working Concept of Motherboard. Concept of RESET, READY, CLOCK Signal.
- VRM Circuit- Overview, Tracing, Hot Testing, Shorting Problem in VRM Circuit, Troubleshooting,
- Internal Structure of VRM Chip, Volt Sense Circuit Concept, Programmable circuit, VID Concept.
- RAM Supply: Identification of all Types of Desktop RAM, RAM Operating Voltage, RAM Supply Pin, All types of possible circuit of RAM Supply. Hot Testing.

Practical Content:

- Identification of Clock Generator, Tracing, Use of Frequency Counter to measure Clock, Troubleshooting.
- USB Port Supply Pin Tracing, Data Pin Tracing.
- Tracing, Supply Circuit of Sound Chip.
- Pin Details of PS 2 Port, Supply Circuit, DATA and CLOCK Circuit.
- SATA Port: Data Pin Tracing of Sata Port.
- Standby Circuit: Standby MOSFET , Circuit tracing.
- PCI Slot: Voltage, Data and Signal Testing.
- Diagnostic Card: LED Status , Coding Concept.
- CRO Machine: Complete Operating of CRO for Voltage, Data and Signal Testing.
- ROM Circuit: Identification of all Types of ROM, ROM Pin Details and Circuit Tracing.
- ROM data and RAM Data: Data Testing on ROM and RAM Data Pin.
- Testing South Bride Supply Circuit.
- Repairing of RAM.
- BIOS Programming/setup by Mini and Universal BIOS Programmer.
- How to Check CPU Socket by CPU Socket Tester.

Module No. 4: Circuit tracing and repairing of laptop and desktop computers

Outcome: Assemble and repair desktop, laptop and its hardware components

Theory Content:

- Volt in Circuit. Tracing and Troubleshooting.
- VRM Circuit. Tracing and Troubleshooting.

- Ram Supply Circuit. Tracing and Troubleshooting.
- Step Down Circuit – 5 Volt and 3.3 Volt. Primary and Secondary Step down.
- Battery Charging and Discharging Circuit. Tracing and Fault Finding.
- Clock Generator Circuit.
- Fan Controller Circuit.
- USB Supply and Data Circuit.
- SATA Supply and Data Circuit.
- HDMI, LAN, AUDIO- Mike, Headphone and Internal Speaker Circuit Tracing.
- E-Sata Port Circuit & CPU Thermal Circuit Tracing.
- ROM – Identification of all types of ROM and Circuit Tracing.
- Schematic Diagram – Laptop Motherboard Circuit Tracing.
- Study on North Bridge & South Bridge Supply.
- Keyboard and Touchpad Circuit.
- Laptop & Desktop BIOS Programming.
- BGA Machine Operation, Chip Reballing.
- How to Download BIOS File from Internet.
- Laptop CPU Socket Details.
- Password Removal Tips.
- Concept of PCH & VGA Port.
- VGA card and graphics processor board
- Input Output Controller chip Connection Circuit.
- Use of DC Supply Machine.
- Laptop Display Assembly.
- Concept of RESET and Identification of all chip of laptop motherboard.
- Common Faults of Laptop , Desktop PCs and Troubleshooting.
- LCD/LED display trouble shooting technique

Practical Content:

- Measure the voltages at different points in a circuit
- Laptop Volt in Circuit Schematic Tracing and Troubleshooting,
- Laptop Adapter Circuit troubleshooting,
- Trace and Troubleshoot of VRAM circuit and RAM Supply.
- Tracing and Fault Finding on Battery.
- Analysis the schematic diagrams of battery charging and discharging circuits in laptops
- Tracing and Fault Finding on different Port Circuits & CPU Thermal Circuit.
- Checking the circuit of VGA card and graphics processor board
- Circuit Tracing and Identification of all types of ROM.
- Test fan controllers under different load conditions and troubleshoot issues related to fan operation and temperature regulation
- Identify USB, SATA, HDMI, LAN and audio circuit components on motherboard schematics
- Perform circuit tracing and thermal testing to diagnose and resolve issues related to E-SATA connectivity and CPU temperature regulation
- Explain BIOS programming procedures and demonstrate the downloading procedure BIOS files from the internet
- Identify different socket of CPU used in laptops and desktops. Installation and Tracing the fault on printer card

- POST Troubleshooting Guide for Desktop and Laptop.
- LCD/ LED display trouble shooting technique

Module No. 5: Safety, Hygiene and cleanliness

Outcome: Maintain personal hygiene, cleanliness and safety at theworkplace.

Theory Content:

- Principles of safety, hygiene, and sanitation for seed processing.
- Identification of risks involved.
- Use of fire control system
- Storing chemicals at proper place.
- Sanitation of processing plants.
- Basic Servicing and maintenance of various equipment, machines involved in processing. Updating of maintenance registers.
- Explain the requirements of personal health, hygiene and fitness at work.
- Describe common health-related guidelines laid down by the organizations/ Government at the workplace.
- Explain the importance of goodhousekeeping at the workplace.

Practical Content:

- Identification of risks involved.
- Use of fire control system.
- Storing chemicals at proper place.
- Sanitation of processing plants.
- Use of emergency switches.
- Disposal of empty containers
- Use of first aid.
- Maintaining of phone directory.
- Demonstrate personal hygienepractices to be followed at the workplace.
- Demonstrate adherence to theworkplace sanitization norms.
- Show how to ensure cleanliness ofthe work area.

Module 6: OJT

Outcome: Work in real job situation with special emphasis on basic safety and hazards in this domain

Practical Content:

Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under

any supervisor / contractor for **60 Hours.**)

Module 7: Employability Skills **(60 Hrs)**

Key Learning Outcomes

Introduction to Employability Skills Duration: 1.5 Hours

After completing this programme, participants will be able to:

1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

Constitutional values - Citizenship Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century Duration: 2.5 Hours

5. Discuss importance of relevant 21st century skills.
6. Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
7. Describe the benefits of continuous learning.

Basic English Skills Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English
10. Write a short note/paragraph / letter/e -mail using basic English

Career Development & Goal Setting Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

Communication Skills Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
13. Explain the importance of active listening for effective communication
14. Discuss the significance of working collaboratively with others in a team

Diversity & Inclusion Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
16. Discuss the significance of escalating sexual harassment issues as per POSH act.

Financial and Legal Literacy Duration:5 Hours

17. Outline the importance of selecting the right financial institution, product, and service
18. Demonstrate how to carry out offline and online financial transactions, safely and securely

19. List the common components of salary and compute income, expenditure, taxes, investments etc.
20. Discuss the legal rights, laws, and aids

Essential Digital Skills Duration: 10 Hours

21. Describe the role of digital technology in today's life
22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely
24. Create sample word documents, excel sheets and presentations using basic features
25. utilize virtual collaboration tools to work effectively

Entrepreneurship Duration: 7 Hours

26. Explain the types of entrepreneurship and enterprises
27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
29. Create a sample business plan, for the selected business opportunity

Customer Service Duration: 5 Hours

30. Describe the significance of analyzing different types and needs of customers
31. Explain the significance of identifying customer needs and responding to them in a professional manner.
32. Discuss the significance of maintaining hygiene and dressing appropriately

Getting Ready for apprenticeship & Jobs Duration: 8 Hours

33. Create a professional Curriculum Vitae (CV)
34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
35. Discuss the significance of maintaining hygiene and confidence during an interview
36. Perform a mock interview
37. List the steps for searching and registering for apprenticeship opportunities

Learning Outcome – Assessment Criteria

Module No.	Outcome	Assessment Criteria
1	Demonstrate various electronics components and test by using measuring instruments	**After completion of this module students will be able to:** 1.1 Identify the formation of current in a circuit 1.2 Apply rules for the flow of current in circuits 1.3 Demonstrate the symbol and function of resistors, capacitors and coil 1.4 Decode colour codding on solid type and SMD type resistors 1.5 Identify solid type and SMD type capacitors based on markings and appearance 1.6 Test diodes for functionality and identify anode and cathode terminals 1.7 Test MOSFETs for functionality and identify N-channel and P-channel types 1.8 Explain the role of crystal in generating clock and pulse signals 1.9 Demonstrate the operation of transformers in stepping up/down voltage 1.10 Construct simple circuit setups with batteries, switches and bulbs.
2	Test and troubleshoot all types of IC and chip for desktop computer and laptop.	**After completion of this module students will be able to:** 2.1 Identify different types of ICs and chips commonly used in desktop computers and laptops. 2.2 Apply proper techniques for soldering and desoldering to ensure reliable connections and prevent damage to components. 2.3 Use desoldering pumps, files, tweezers, SMD machines, and hot melt guns effectively for component removal and installation. 2.4 Test IC sockets for proper connectivity and functionality, ensuring reliable connections with ICs. 2.5 Demonstrate proficiency in IC reballing and reflowing techniques to repair soldering-related issues. 2.6 Apply troubleshooting methodologies to diagnose issues related to ICs and chips in desktop

Module No.	Outcome	Assessment Criteria
		computers and laptops. 2.7 Use tools accurately and effectively to conduct tests and diagnose hardware issues. 2.8 Set up and calibrate all types of IC and chip soldering/desoldering equipment to ensure proper functionality. 2.9 Adhere to safety protocols and procedures when soldering, desoldering, and testing ICs and chips.
3	Diagnose and test all types of Motherboard	**After completion of this module students will be able to:** 3.1 Identify all types of chips, ports, sockets, and slots on a motherboard. 3.2 Explain the working concept of a motherboard, including the roles of RESET, READY, and CLOCK signals. 3.3 Identify various types of desktop RAM and their operating voltages. 3.4 Identify clock generator components on the motherboard. 3.5 Trace USB port supply and data pins, as well as sound chip supply circuits. 3.6 Identify PS/2 port pins and their functions. 3.7 Troubleshoot data transmission issues in SATA ports. 3.8 Identify standby MOSFET components and trace standby circuitry. 3.9 Operate CRO machines to test voltage levels, data signals, and signal integrity. 3.10 Identify various types of ROM components and their pin details. 3.11 Demonstrate techniques for repairing faulty RAM modules, such as reflowing solder joints or replacing defective components.
4	Assemble and repair desktop, laptop and its hardware components	**After completion of this module students will be able to:** 4.1 Measure voltages at various points in a circuit to assess proper voltage distribution. 4.2 Utilize multimeters or oscilloscopes to accurately measure voltages.

Module No.	Outcome	Assessment Criteria
		4.3 Trace VRAM, RAM supply, and other specified circuits to identify potential faults or issues. 4.4 Analyze battery circuits and measure voltages to ensure proper charging and discharging. 4.5 Trace USB, SATA, HDMI, LAN, and audio circuits to locate potential faults. 4.6 Identify components such as USB, SATA, HDMI, LAN, and audio circuits on motherboard schematics. 4.7 Explain BIOS programming procedures and demonstrate the downloading procedure for BIOS files from the internet. 4.8 Identify various chips present on laptop motherboards and understand their functions. 4.9 Identify common faults in laptops, such as power issues, display problems, and component failures.
5	Maintain personal hygiene, cleanliness and safety at theworkplace.	**After completion of this module students will be able to:** 5.1 Describe fundamental principles of safety, hygiene, and sanitation specific to seed processing, demonstrating an understanding of best practices and industry standards. 5.2 Identify potential risks associated with seed processing operations, showcasing awareness and risk assessment skills 5.3 Explain the correct storage practices for chemicals used in seed processing, ensuring compliance with safety regulations. 5.4 Demonstrate basic servicing and maintenance tasks for seed processing equipment and machines, including the accurate updating of maintenance registers. 5.5 Describe common health-related guidelines mandated by organizations or government bodies for the workplace, showcasing awareness of regulatory standards. 5.6 Demonstrate the proper sanitation procedures for seed processing plants, showcasing practical skills in maintaining a clean workplace.

Module No.	Outcome	Assessment Criteria
		5.7 Perform the proper disposal of empty containers in a practical setting, following environmentally friendly and safe disposal practices. 5.8 Maintain a phone directory in a practical setting, showcasing organizational skills and readiness to contact relevant personnel in case of emergencies. 5.9 Exhibit effective methods for ensuring cleanliness in the work area in housekeeping and sanitation practices
6	OJT	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).
7	Employability Skill	As per guided curriculum

List of Tools, Equipment & materials needed for 30 Trainees (Practical)

S No.	Name of the Tool & Equipment	Specification	Quantity
1.	R & D Breadboards		10
2.	Digital IC Tester, to check Analog / Digital IC problems.		4
3.	PTH De-Soldering Station to work on today's multilayer PCB's		2
4.	SMD Rework Station		2
5.	Solder Bath to work on Multi leg PTH component.		2
6.	Micro Soldering Station to carry out soldering on micro SMD components.		1
7.	Digital Microscope to enlarge SMD microelectronics world to 200X magnification on screen and do the operation seeing the monitor.		1

S No.	Name of the Tool & Equipment	Specification	Quantity
8.	Logic analyzer		1
9	100 Mhz Duel Trace Digital Storage Oscilloscope an imp.		1
10	400 Mhz Frequency Counter		1
11	Function Generator an debug & diagnostic tools.		1
12	0 – 30 V, 0 – 5 A Duel Track Power Supply a must to troubleshoot power problems.		1
13	Advanced Post Card PCI for desktop.		2
14	Advanced Post card for laptop Mini PCI & Express		2
15	Universal ROM Programmer		2
16	Used laptop, desktop		2 each
17	Used mother board		2

Outcome	Outcome Code	Total Th marks	Total Pr marks	Total OJT marks
Demonstrate various electronics components and test by using measuring instruments	ELE/1027/OC1	30	140	0
Test and troubleshoot all types of IC and chip for desktop computer and laptop.	ELE/1027/OC2	30	90	0
Diagnose and test all types of Motherboard	ELE/1027/OC3	30	140	0
Assemble and repair desktop, laptop and its hardware components	ELE/1027/OC4	30	140	0
Maintain personal hygiene, cleanliness and safety at the workplace.	ELE/1027/OC5	30	140	0
Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	ELE/1027/OC6	0	0	150
Employability Skills – 60 Hrs	DGT/VSQ/N0102	50	0	0