



IAS YOUTH COMPUTER CENTRE

ITI FITTER

Trade Theory • Workshop Practice • Measurement • Fitting • Maintenance • Career Skills

INSTITUTE ADDRESS

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Measure • Mark • Cut • File • Drill • Fit • Assemble • Inspect

About This Book

This book is designed as a practical learning resource for an ITI Fitter programme. The structure follows the broad sequence of the current Fitter trade curriculum: occupational safety, tools and workshop practice, marking and measuring, fitting operations, drilling, tapping, fastening, assembly, precision measurement, maintenance and project work.

The Directorate General of Training (DGT) lists Fitter as a designated trade, and Bharat Skills provides the current CTS Fitter syllabus and learning resources. The published Fitter syllabus includes basic fitting operations such as marking, hacksawing, chiseling, filing, drilling, tapping and grinding, with dimensional accuracy requirements. ■cite■turn0search2■turn0search26■

The published second-year material expands into mating surfaces, surface finishing, fastening, power tools, precision drilling/reaming/tapping, dovetail and radius fitting, slip gauges, lapping and related precision work.

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Important course note: This is a training book created for classroom and workshop support. It does not itself establish NCVT/SCVT affiliation, certification status, duration or eligibility for any particular institute. Those details should be verified from the applicable official authority.

Learning Outcomes

After completing this book, learners should be able to identify and safely use common fitter tools; read basic workshop drawings; measure and mark workpieces; perform filing, sawing, chiseling, drilling, reaming, tapping and grinding operations; produce basic mating components; use gauges and measuring instruments; assemble components with fasteners; perform basic maintenance and troubleshooting; maintain workshop records; and complete a practical fitter project with dimensional and quality checks.

Workshop Safety First

Fitting work involves sharp tools, rotating machines, metal chips, noise, dust and heavy components. Always follow the workshop's risk assessment, PPE requirements, machine guarding, safe operating procedures and instructor supervision. Never remove guards or operate unfamiliar machinery without authorization and training.

Contents

1. Introduction to the Fitter Trade & Workshop Organization
2. Occupational Safety, PPE, First Aid & Housekeeping
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10. Reaming, Countersinking, Counterboring & Hole Finishing
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12. Grinding, Deburring & Surface Finishing
13. Fitting Assemblies, Keys, Pins, Cotter & Mating Surfaces
14. Precision Measurement, Gauges, Vernier & Micrometers
15. Lapping, Honing, Scraping & Advanced Fitting
16. Workshop Maintenance, Power Tools & Basic Troubleshooting
17. Quality Control, Job Planning, Costing & Professional Practice
18. Final Fitter Project, Practical Assessment & Career Readiness

Practical Portfolio: PPE checklist • tool identification • material chart • measurement sheet • marking exercise • hacksaw job • filing job • drilling job • reaming job • tapping job • grinding practice • fastener assembly • precision measurement • lapping/scraping practice • maintenance log • inspection report • final fitting project

1. Introduction to the Fitter Trade & Workshop Organization

Chapter Focus

A fitter prepares, shapes, finishes, assembles and checks engineering components using hand tools, machines and measuring instruments. The trade supports manufacturing, maintenance, repair and fabrication activities.

Key Skills & Terms

- Fitter
- Workshop
- Bench work
- Component
- Assembly
- Maintenance
- Tolerance
- Inspection

Practical Exercise

Prepare a workshop map showing bench area, machine area, tool storage, inspection area, first-aid point and waste-disposal point.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

2. Occupational Safety, PPE, First Aid & Housekeeping

Chapter Focus

Safety is integrated throughout fitter training. The current syllabus includes PPE, first aid, hazard identification, safety signs, waste disposal and good shop-floor practices. ■cite■turn0search26■

Key Skills & Terms

- PPE
- Safety sign
- Guard
- Hazard
- Risk
- First aid
- Housekeeping
- Metal chips

Practical Exercise

Complete a pre-start safety checklist and identify 10 hazards in a model fitting workshop.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

3. Fitter Tools, Workholding Devices & Workshop Equipment

Chapter Focus

Fitter tools include files, hacksaws, chisels, hammers, punches, screwdrivers, spanners, pliers and measuring instruments. Workholding devices include vices, clamps and fixtures.

Key Skills & Terms

- Bench vice
- Hacksaw
- File
- Chisel
- Punch
- Clamp
- Spanner
- Fixture

Practical Exercise

Identify 20 tools and record their purpose, safe-use rule and storage method.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

4. Engineering Materials, Metals & Material Identification

Chapter Focus

Common engineering materials include mild steel, carbon steel, stainless steel, cast iron, aluminium, brass, copper and engineering plastics. Material selection depends on strength, machinability, corrosion resistance and application.

Key Skills & Terms

- Ferrous
- Non-ferrous
- Mild steel
- Cast iron
- Aluminium
- Brass
- Hardness
- Machinability

Practical Exercise

Create a material-identification chart with properties, common uses and safe handling notes.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

5. Measurement, Marking & Basic Workshop Calculations

Chapter Focus

Accurate measurement and marking are fundamental. Fitter work uses scales, steel rules, try squares, scribes, dividers, punches, calipers and other measuring tools.

Key Skills & Terms

- Steel rule
- Try square
- Scriber
- Divider
- Punch
- Caliper
- Datum
- Allowance

Practical Exercise

Measure a sample workpiece, mark a datum, scribe a layout and verify dimensions before cutting.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

6. Engineering Drawings, Symbols, Tolerances & Fits

Chapter Focus

Drawings communicate dimensions, shapes, holes, threads, tolerances and assembly requirements. Fits describe the relationship between mating components.

Key Skills & Terms

- Orthographic view
- Section
- Dimension
- Tolerance
- Fit
- Clearance
- Allowance
- Datum

Practical Exercise

Read a simple component drawing and list all dimensions, holes, threads, tolerances and inspection requirements.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

7. Hacksawing, Chiseling & Basic Cutting Operations

Chapter Focus

Hacksawing and chiseling are basic cutting operations. Correct blade selection, workholding, cutting direction and chip control help produce safe and accurate work.

Key Skills & Terms

- Hacksaw blade
- Pitch
- Chisel
- Cutting line
- Workholding
- Burr
- Chip
- Allowance

Practical Exercise

Cut a marked practice piece under supervision and inspect straightness, squareness and remaining allowance.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

8. Filing, Surface Preparation & Precision Hand Fitting

Chapter Focus

Filing removes small amounts of material and improves shape and surface finish. Different file profiles and grades are selected according to the job.

Key Skills & Terms

- Flat file
- Half-round
- Round file
- Square file
- Coarse
- Second cut
- Smooth
- Draw filing

Practical Exercise

Produce a flat and square surface on a practice block and verify it using a try square and measuring tool.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

9. Drilling Machines, Drill Bits & Hole Making

Chapter Focus

Drilling creates holes using twist drills and drilling machines. Safe practice includes correct speed/feed selection, workholding, drill condition and chip removal.

Key Skills & Terms

- Twist drill
- Drill chuck
- Spindle
- Feed
- Speed
- Pilot hole
- Through hole
- Blind hole

Practical Exercise

Drill a supervised practice hole, checking location, diameter, perpendicularity and burr condition.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

10. Reaming, Countersinking, Counterboring & Hole Finishing

Chapter Focus

Reaming improves hole size and finish. Countersinking and counterboring prepare holes for particular fasteners or component features.

Key Skills & Terms

- Reamer
- Hand reamer
- Machine reamer
- Countersink
- Counterbore
- Hole tolerance
- Finish
- Chamfer

Practical Exercise

Prepare a drilled hole for reaming and record before/after diameter and surface observations.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

11. Tapping, Threading, Screws, Bolts, Nuts & Fasteners

Chapter Focus

Threads allow components to be joined and adjusted. Fitter training includes tapping, thread forms, screws, bolts, nuts and tools for tightening/loosening.

Key Skills & Terms

- Tap
- Tap wrench
- Thread
- Pitch
- Major diameter
- Minor diameter
- Bolt
- Nut

Practical Exercise

Practice tapping a prepared hole under supervision. Check alignment, thread cleanliness and fastener fit.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

12. Grinding, Deburring & Surface Finishing

Chapter Focus

Grinding can remove material, sharpen tools and improve edges or surfaces. Correct wheel selection, guarding, tool rest setting and eye/face protection are essential.

Key Skills & Terms

- Grinding wheel
- Wheel guard
- Tool rest
- Spark
- Dressing
- Deburring
- Abrasive
- Surface finish

Practical Exercise

Inspect a grinding machine before use and perform a supervised deburring/sharpening exercise.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

13. Fitting Assemblies, Keys, Pins, Cotters & Mating Surfaces

Chapter Focus

Assembly work brings components together using bolts, screws, pins, keys, cotters and other fastening methods. The current Fitter curriculum includes fastening and different mating surfaces. ■cite■turn0search25■

Key Skills & Terms

- Dowel pin
- Key
- Cotter
- Bolt
- Screw
- Mating surface
- Torque
- Assembly

Practical Exercise

Make a simple two-part fitting assembly and check alignment, movement and fastening.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

14. Precision Measurement, Gauges, Vernier & Micrometers

Chapter Focus

Precision measurement supports dimensional control. Tools include vernier calipers, micrometers, depth gauges, feeler gauges and other gauges; precision work requires correct zeroing and technique.

Key Skills & Terms

- Vernier caliper
- Micrometer
- Depth gauge
- Feeler gauge
- Gauge
- Zero error
- Least count
- Tolerance

Practical Exercise

Measure a sample component at multiple points and record readings, variation and acceptance decision.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

15. Lapping, Honing, Scraping & Advanced Fitting

Chapter Focus

Advanced fitting may include scraping, lapping and honing to improve mating surfaces and surface finish. The second-year curriculum includes lapping, honing, scraping and precision fitting. ■cite■turn0search25■turn0search27■

Key Skills & Terms

- Scraping
- Lapping
- Honing
- Abrasive
- Lapping plate
- Surface finish
- Wringing
- Precision fit

Practical Exercise

Observe a supervised lapping or surface-finishing demonstration and document the purpose, sequence and inspection method.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

16. Workshop Maintenance, Power Tools & Basic Troubleshooting

Chapter Focus

Power tools and workshop machines require inspection, correct accessories and safe operation. Maintenance includes cleaning, lubrication where specified, tool condition checks and reporting defects.

Key Skills & Terms

- Power tool
- Inspection
- Lubrication
- Preventive maintenance
- Defect
- Isolation
- Service log
- Troubleshooting

Practical Exercise

Prepare a maintenance log for five workshop tools and record inspection frequency and corrective action.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

17. Quality Control, Job Planning, Costing & Professional Practice

Chapter Focus

Quality control includes dimensional inspection, surface condition, fit, function and documentation. Job planning also considers material, tools, sequence, time, safety and waste.

Key Skills & Terms

- Quality
- Inspection
- Tolerance
- Job card
- Material take-off
- Productivity
- Rework
- Handover

Practical Exercise

Create a job card for a fitting task with drawing reference, operations, tools, inspection points and estimated time.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

18. Final Fitter Project, Practical Assessment & Career Readiness

Chapter Focus

The final project should combine measurement, marking, cutting, filing, drilling, threading/fastening, assembly and inspection. The official Fitter curriculum uses practical exercises and project-oriented skills to develop occupational competence.

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Key Skills & Terms

- Project
- Method sheet
- Measurement
- Fitting
- Assembly
- Inspection
- Viva
- Portfolio

Practical Exercise

Final project: manufacture and assemble a small two- or three-part fitting job from a drawing. Submit drawing interpretation, process sheet, tool list, measurements, inspection report, finished component and viva answers.

Quick Revision

1. Inspect the work area. 2. Read the drawing or job instruction. 3. Select correct tools and material. 4. Mark accurately. 5. Perform the operation safely. 6. Measure and inspect. 7. Record the result and correct defects.

Fitter Workshop Daily Checklist

PPE checked • bench vice secure • tools inspected • machine guards in place • electrical connections checked • measuring tools clean • chips/waste removed safely • aisles clear • lubrication/maintenance status checked • first-aid and emergency arrangements known.

Measurement Record

Job | Feature | Nominal Size | Instrument | Least Count | Reading 1 | Reading 2 | Reading 3 | Variation | Acceptance

Job Card Template

Job No. | Drawing No. | Material | Operation Sequence | Machine/Tool | Cutting/Working Data | Inspection Point | Time |
Remarks

Tool Maintenance Record

Tool/Equipment | Condition | Cleaning | Lubrication | Defect | Corrective Action | Checked By | Date

Quality Inspection Checklist

Dimensions verified • datums identified • surfaces square/parallel where required • holes correctly located • threads clean • burrs removed • mating surfaces checked • fasteners correctly fitted • movement/function checked • final dimensions recorded.

Workshop Calculation & Science Quick Reference

Length conversions • area and volume • ratio and proportion • basic geometry • angle measurement • simple speed/feed concepts • material weight estimation • percentage and allowance calculations. Use the formulas and units specified by the instructor/job specification.

Final Practical Assessment

Part A: safety/PPE. **Part B:** tool identification. **Part C:** measurement and marking. **Part D:** hacksawing/chiseling/filing. **Part E:** drilling/reaming. **Part F:** tapping/fastening. **Part G:** precision measurement. **Part H:** assembly and inspection. **Part I:** final project and viva.

Career Readiness

Possible pathways include fitter, maintenance fitter, production fitter, assembly technician, machine-shop assistant, fabrication support, maintenance support and apprenticeship roles. Actual eligibility, trade recognition and job requirements depend on the employer and applicable qualification framework.

Glossary

Datum — reference point/line/surface used for measurement. **Tolerance** — permitted variation from a specified dimension.

Clearance fit — mating parts have intentional clearance. **Interference fit** — mating parts require force/thermal methods as designed.

Reamer — tool used to improve an existing hole. **Tap** — tool used to produce internal threads. **Gauge** — device used to check a feature or dimension. **Lapping** — fine abrasive finishing process. **Honing** — controlled abrasive finishing process. **Burr** — unwanted sharp raised edge after machining/cutting.



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