Preface to NSQF (Level-4) Compliant Edition



Directorate General of Training (DGT) under the Ministry of Skill Development and Entrepreneurship (MSDE) is the apex body in the country as regards planning, formulating and prescribing norms, standards, procedures, and guidelines in respect of various vocational training schemes of which Craftsmen Training Scheme (CTS) implemented in ITI's is the most important and wide-spread throughout the country. Prescribing well-designed curriculum and putting in place appropriate assessment and certification procedure, are among the vital aspects of vocational training.

Fitter (Sector: Capital Goods & Manufacturing) is one among the top couple of most popular ITI designated trades and is of two-year duration. In view of the fact that training in ITI's is primarily practical-oriented, a major part of training time (70%) is devoted to practical.

This *latest revised edition of Fitter Trade Practical Book* fully covers the professional skill (trade practical) part of the latest DGT-prescribed syllabus. Moreover, arrangement of modules and practical exercises therein has been done following NIMI-pattern. This will obviously help trainees learn and acquire practical skills sequentially.

An added feature of this edition is that a set of most important practical jobs, as often appeared in All India Trade Tests, has been compiled and appended for the benefit of trainees to familiarise with and practice such jobs and thus prepare well for the final trade test.

We sincerely hope that trainees will find this book very much helpful to adjust with the latest changes in syllabus related to Fitter Trade Practical. We would welcome suggestions for further improvement of this book in its subsequent editions.

— Author



Contents

NSQF (Level-4) Compliant Competency based Curriculum for Fitter Trade Practical (Latest Rev. Syllabus of 1200 Hrs).....ix – xii

1st Year

MODULE **PAGES**

1. SAFETY 3–9

General Workshop Safety Precautions 3
First Aid 3
Electrical Safety, Ppe, Response To Emergencies 5
House Keeping And Good Shop Floor Practices 9

2. BASIC FITTING 10–87

Exercise 1 : Identification of tools and equipment as per desired specification for marking and sawing 10
Exercise 2 : Selection of Material as per Application 13
Exercise 3 : Visual Inspection of Raw Materials for Rusting, Scaling, Corrosion etc. 14
Exercise 4 : Filing Flat and Square (Rough Finish) 14
Exercise 5 : Filing and Hacksawing 15
Exercise 6 : Marking and Filing 17
Exercise 7 : Marking and Filing 19
Exercise 8 : Marking and Filing 21
Exercise 9 : Filing and Chipping 23
Exercise 10 : Angular Filing 25
Exercise 11 : Filing, Drilling, Countersinking and Counterboring. 27
Exercise 12 : Filing, Drilling, Tapping and External Threading 29
Exercise 13 : Filing and Fitting 31
Exercise 14 : Filing and Fitting 36
Exercise 15 : Filing and Fitting 40
Exercise 16 : Filing and Dovetail Fitting 43
Exercise 17 : Filing, Drilling, Tapping and Fitting 46
Exercise 18 : Filing and Fitting 50
Exercise 19 : Filing and Fitting. 53
Exercise 20 : Filing and Fitting 56
Exercise 21 : Filing and Fitting 59
Exercise 22 : Filing and Fitting 63
Exercise 23 : Filing, Drilling, Tapping and Fitting 66
Exercise 24 : Filing, Reaming, Tapping and Fitting 70
Exercise 25 : Filing, Reaming, Tapping and Fitting 72
Exercise 26 : Filing, Reaming, Tapping and Fitting 75
Exercise 27 : Marking of Straight Lines and Arcs using Scribing Block and Dividers. 77
Exercise 28 : Chipping Flat Surfaces along a Marked Line 79
Exercise 29 : Marking, Filling, Flat, Square and Check using Try-Square 80

Exercise 30 : Finding Center of Round Bar with the help of V Block and Marking Block 81
Exercise 31 : Sharpening of Chisel 82
Exercise 32 : File and Saw on MS Square and Pipe 83
Exercise 33 : Chipping Sheet Metal (Shearing) 85
Exercise 34 : Punch Letter and Number (Letter Punch and Number Punch) 86
Exercise 35 : Practice Use of Different Punches. 87

3. SHEET METAL 88–110

Exercise 1 : Marking and Cutting Straight Line 88
Exercise 2 : Marking of Curves and Curve Cutting 89
Exercise 3 : Marking and Cutting (Straight and Curve) 91
Exercise 4 : Marking and Cutting (Straight and Curve) 92
Exercise 5 : Marking and Cutting Different Angles and Shapes (Geometrical) on Sheet Metal 94
Exercise 6 : Marking and Cutting Different Angles, Shapes (Geometrical) on Sheet Metal 97
Exercise 7 : Marking a Hollow Square Shape 100
Exercise 8 : Making a Hollow Cylinder 102
Exercise 9 : Making Lap joint - Soldered 104
Exercise 10 : Making Butt Joint - Soldered with Single Strap 105
Exercise 11 : Marking and Profile Cutting 107
Exercise 12 : Rectangular Tray with Flaps – its Marking and Soldering 109

4. WELDING 111–120

Exercise 1 : Depositing Continuous Beads by Arc Welding on M.S. Plate without Weaving 111
Exercise 2 : Welding Full Open Corner Joint by Arc Welding on M.S. Plate 113
Exercise 3 : Making Single Pass Fillet Weld by Arc Welding on M.S. Plate 114
Exercise 4 : Making Single 'V' Butt Joint by Arc Welding on M.S. Plate 115
Exercise 5 : Running a Bead by Gas Welding without using Filler Wire 116
Exercise 6 : Running a Bead by Gas Welding using Filler Wire 117
Exercise 7 : Weld Open Square Joint by Gas Welding 118
Exercise 8 : Weld Fillet Joint by Gas Welding in Horizontal - Vertical Position 119
Exercise 9 : Oxy-acetylene Cutting of Plates 120

5. DRILLING AND FITTING ASSEMBLY 121–158

Exercise 1 : Filing Drilling, Reaming, Countersinking, and Counterboring 121
Exercise 2 : Filing, Reaming, Tapping and Counter boring 123
Exercise 3 : Filing, Drilling, Tapping and Reaming 125
Exercise 4 : Filing, Chamfering and Tapping 127
Exercise 5 : Filing and Chamfering 129
Exercise 6 : Filing, Sawing, Grooving and Chamfering 131
Exercise 7 : Filing, Drilling and Grooving 133
Exercise 8 : Filing, Blind Hole Tapping and Grooving 135
Exercise 9 : Filing and Slotting 137
Exercise 10 : Filing, Drilling, Tapping, Reaming, External Threading and Location of Holes 139
Exercise 11 : Scraping Flat Surfaces using Three Plate Method 141
Exercise 12 : Scrapping Bearing Surface 143
Exercise 13 : Filing, Drilling, Countersinking and Riveting 144
Exercise 14 : Filing and Fitting 146
Exercise 15 : Filing, Drilling, Reaming and Fitting 148
Exercise 16 : Filing, Tapping, Countersinking and Step Fitting 150
Exercise 17 : Filing, Bending, Drilling, Countersinking and Riveting 152
Exercise 18 : Filing and Fitting 154
Exercise 19 : Filing and Fitting 156

6. TURNING 159–171

Exercise 1 : Facing 159
Exercise 2 : Plain Turning 160
Exercise 3 : Facing and Chamfering 162
Exercise 4 : Step Turning 163
Exercise 5 : Plain and Step Turning, Simple Taper Turning and Knurling 164
Exercise 6 : Plain and Taper Turning, Radius and Step Turning 166
Exercise 7 : Plain Turning, Chamfering, Undercutting and External Threading 167
Exercise 8 : Plain and Stepped Internal and External Turning and Boring 169
Exercise 9 : Boring and Scraping Cylindrical Bore 170

7. BASIC MAINTENANCE 172–174

Exercise 1 : Dismantling and Assembling Globe Valve 172
Exercise 2 : Dismantling and Assembling Non-return Valve 174

2nd Year

MODULE **PAGES**

1. ASSEMBLY 1 3–76

Exercise 1 : Filing, Sawing, Drilling, Riveting and Centre Line Alignment 3
Exercise 2 : Filing and Square Fitting 5
Exercise 3 : Filing, Slotting, Tapping and Fitting 7
Exercise 4 : Filing and Angular Fitting 10
Exercise 5 : Filing and Radius Filing 12
Exercise 6 : Filing and Tongue Fitting 15
Exercise 7 : Filing and Angular Fitting 18
Exercise 8 : Filing, Fitting and Scraping Angular Surfaces 20
Exercise 9 : Filing and Radius Fitting 22
Exercise 10 : Filing, Drilling , Tapping and Fitting 25
Exercise 11 : Filing and Key Fitting 27
Exercise 12 : Filing and Fitting 29
Exercise 13 : Filing, Grooving and Fitting 32
Exercise 14 : Filing, Grooving, Tapping and Fitting 35
Exercise 15 : Filing, Tapping and Radius Fitting 38
Exercise 16 : Filing, Tapping, Radius and Angular Fitting 41
Exercise 17 : Filing, Tapping, Reaming and Fitting 44
Exercise 18 : Filing, Reaming, Tapping and Fitting 47
Exercise 19 : Filing, Drilling and Fitting 50
Exercise 20 : Filing, Drilling, Tapping and Fitting 53
Exercise 21 : Filing and Fitting 56
Exercise 22 : Filing and Fitting 59
Exercise 23 : Filing and Fitting 62
Exercise 24 : Filing, Tapping and Fitting 65
Exercise 25 : Filing, Drilling, Tapping and Fitting 68
Exercise 26 : Filing, Radius and Tongue Fitting 71
Exercise 27 : Filing and Fitting 74

2. GAUGES 77–83

Exercise 1 : Centre Gauge 77
Exercise 2 : Angle Grinding Gauge 79
Exercise 3 : Snap Gauge ‘Go’ and ‘No Go’ 80
Exercise 4 : Lapping Flat Surface and Hole 82

3. PIPES AND PIPE FITTING 84–91

Exercise 1 : Pipe Cutting (Using Pipe Cutter) 84
Exercise 2 : Pipe Bending (By Hot Method) 86
Exercise 3 : Pipe Bending (By Cold Method) 88
Exercise 4 : Pipe Threading (Using Die Stocks) 90

4. REPAIRING TECHNIQUES 92–160

Exercise 1 : Filing, Radius and Dovetail Fitting 92
Exercise 2 : Filing, Reaming, Tapping and Fitting 96
Exercise 3 : Filing, Reaming and 'H' Fitting 99
Exercise 4 : Filing and Fitting 101
Exercise 5 : Filing and Fitting 105
Exercise 6 : Filing and Pentagon Fitting 108
Exercise 7 : Filing and Plus Fitting 110
Exercise 8 : Filing and Regular Triangle Universal Fitting 113
Exercise 9 : Filing and Diagonal Plus Fitting 115
Exercise 10 : Filing and Octagon Fitting 118
Exercise 11 : Filing and Universal Fitting 121
Exercise 12 : Filing and Fitting 123
Exercise 13 : Filing and Hexagon Fitting 127
Exercise 14 : Filing, Drilling, Tapping, Countersinking, Counterboring and Dovetail Fitting 129
Exercise 15 : Filing, Turning, Facing and Threading on Lathe (Gear Puller) 131
Exercise 16 : Slide Fitting 134
Exercise 17 : Three Piece Fitting 137
Exercise 18 : Four Piece 'S' Fitting 140
Exercise 19 : ITI Fitting 143
Exercise 20 : Dismantling and Mounting of Pulleys 145
Exercise 21 : Making and Replacing Damaged Keys 148
Exercise 22 : Repairing Damaged Gears 149
Exercise 23 : Repair and Replacement of Belts and Check for Workability 150
Exercise 24 : Making of Template / Gauge to Check Involute Profile 153
Exercise 25 : Repair of Broken Gear Tooth by Stud and Repair Broken Gear Teeth by Dovetail 155
Exercise 26 : Prepare different types of Documentation as per Industrial need by Different Methods of Recording Information 157

5. DRILL JIG 161–165

Exercise 1 : Making a Simple Drill Jig 161
Exercise 2 : Use Simple Jigs and Fixtures for Drilling 164

6. HYDRAULICS AND PNEUMATICS 166–178

Practical exercises (Pneumatic controls) 170
Practical exercises (Hydraulic controls) 175

7. PREVENTIVE MAINTENANCE 179–191

Exercise 1 : Dismantle, Overhauling & Assemble Cross Slide and Hand Slide of Lathe Carriage 179
Exercise 2 : Simple Repair of Machinery: Making of Packing Gaskets 181
Exercise 3 : Check Washers, Gasket, Clutch, Keys, Jibs, Cotter, Circlip etc and Replace / Repair if needed 182
Exercise 4 : Use Hollow Punches, Extractor, Drifts, various types of Hammers, and Spanners etc for Repair Work 185
Exercise 5 : Dismantling, Assembling of different types of Bearing and Check for Functionality 186
Exercise 6 : Perform Routine Check of Machine and do Replenish as per Requirement 186
Exercise 7 : Inspection of Machine Tools such as Alignment, Levelling 187
Exercise 8 : Accuracy Testing of Machine Tools such as Geometrical Parameters 190

8. ERECTION AND TESTING 192–198

Exercise 1 : Making Various Knots 192
Exercise 2 : Erection of Tripod and Lifting Load 195
Exercise 3 : Erection and Testing of Machine Tools 196

Appendix : Practical Jobs for Practice 199–222