GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

MECHANIC LENS/ PRISM GRINDING

(Duration: One Year)
Revised in July 2022

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 3

SECTOR – CAPITAL GOODS AND MANUFACTURING

Directorate General of Training

MECHANIC LENS/ PRISM GRINDING

(Engineering Trade)

(Revised in July 2022)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 3

Developed By

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1. COURSE INFORMATION

During the one-year duration a candidate is trained on subjects Professional Skill, Professional Knowledge and Employability Skills related to job role. In addition to this a candidate is entrusted to make/do project work and extra-curricular activities to build up confidence. The practical skills are imparted in simple to complex manner & simultaneously theory subject is taught in the same fashion to apply cognitive knowledge while executing task. The broad components covered under Professional Skill subject are as below: -

The contents covered are from safety aspect related to the trade, basic fitting operations viz., making, filing, sawing, chiseling, drilling, tapping, grinding to an accuracy of ±0.25mm. Making different components such as Mirrors (glass mirror, furniture mirror, concave mirror, convex mirror etc.), Painting of glass, Polishing of Glass, and Periscope etc. within required accuracy. The practical training, it starts with operation of Lens Format cutting machine, Lens Grinding machine Opto lab. Followed by different operation such as Curve generation, Grinding, Smoothing, Polishing & Hand Polishing, Centering &Edging, cementing of lenses, Fusion of Lenses, Anti reflection coatings to manufacture spectacles Lenses, Prism and other flat surfaces etc. within required accuracy. Further surface finish of optical components and for Inspection of various parameters of Lens use of optical instruments and devices such as Telescope, Microscope, Binoculars, Periscope, Range Finder, Theodolites. Night Vision devices, Lensometer, Auto Refractometer, Slit lamp, Lens tray, Lens frame, optical refraction unit, Phoropter, Retinoscope and idea about optical aberrations etc.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of the economy/ labour market. The vocational training programs are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer programs of DGT for propagating vocational training.

Mechanic Lens/ Prism Grinding trade under CTS is delivered nationwide through network of ITIs. The course is of one year duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Employability Skills) imparts requisite core skills, knowledge and life skills. After passing out the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Candidates need broadly to demonstrate that they are able to:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs.
- Document the technical parameters related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Apprenticeship programme in different types of industries leading to a National Apprenticeship certificate (NAC).
- Can join various industries of the relevant field.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year:

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	840
2	Professional Knowledge (Trade Theory)	240
3	Employability Skills	120
	Total	**1200**

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

4	On the Job Training (OJT)/ Group Project	150

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses.

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The Continuous Assessment(Internal) during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by Controller of examinations, DGT as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising some of the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work
- Computer based multiple choice question examination
- Practical Examination

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examination body. The following marking pattern to be adopted for formative assessment:

Performance Level	Evidence
(a) Marks in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate with occasional guidance and showing due	• Demonstration of good skill in the use of hand tools, machine tools and

regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	workshop equipment • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b)Marks in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Marks in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Glass Cutter, Other; Glass Cracker; Glass Trimmer cuts glass tubes, rods, sheets or other articles to specified sizes and shapes, using hand tools or cutting machine. Lays stock of glass sheet, tubes or rods on padded surface of table, places pattern on glass article, marks out and cuts pattern with glass cutter tool; breaks away excess glass by hand or with notched tool. Stocks cut part aside for removal. May grind and smoothen edges, using belt sander.

Mirror Silverer; Silverer Mirror coats new and old mirror glass with silvering solutions. Weighs and mixes ingredients according to formula to prepare silvering solution of required consistency; places cleaned mirror glass on silvering table; covers surface of glass with silvering solution and levels glass by means of wedges so that solution may not run off; allows silvering solution to remain on glass for prescribed period, drains excess of solution from glass and washes silvered glass in distilled water; dries mirror on drying table; coats silvered surface of glass with copper solution and protective paint to protect silvering from moisture. May spray silvering solution over glass surface using spray gun.

Lens Grinder; operates grinding machine to grind surfaces of lens blanks to required curvature and thickness. Selects metal grinding disc with required dioptric curve and clamps it on spindle of machine. Places metal block with mounted lens blank in position against grinding disc. Starts machine and applies various grades of abrasives or emery paste to disc as required periodically during grinding process for surfacing the lens blank; removes block from machine after specified time and examines blanks for defects. Uses different curvature metallic discs for surfacing both sides of the lens blank in case of cylindrical or spherical lenses. May mount blanks on metal block.

Lens Polisher (Optical); sets and operates machine to polish surfaces of lens blank to high lustre. Selects and fits felt-lined polishing mould of required size and curvature on lower spindle of machine; position block on which lens blanks are mounted against polishing tool; starts machine and applies rouge or any other polishing compound to disc periodically during polishing process to polish blank to required level of lustre. Stops machine and removes block after specified time to examine blanks for defects. May operate battery of polishing machines. May operate cylindrical polishing machine.

Reference NCO-2015:

a) 7315.2000 - Glass Cutter, Other
b) 7316.1100 - Mirror Silverer
c) 7315.1200 - Lens Grinder
d) 7315.1400 - Lens Polisher (Optical)

Reference NOS: –

a) PSC/NO133v1.0, PSC/NO132, PSC/NO134, PSC/NO135, PSC/N9901 v 1.0

b) LFS/N9401
c) LFS/N9402
d) LFS/N9403
e) LFS/N9404
f) LFS/N9405
g) LFS/N9406
h) LFS/N9407
i) LFS/N9408
j) LFS/N9409
k) LFS/N9410
l) CSC/N9401
m) CSC/N9402

4. GENERAL INFORMATION

Name of the Trade	**MECHANIC LENS/ PRISM GRINDING**
Trade Code	DGT/1113
NCO - 2015	7315.2000, 7316.1100**,** 7315.1200, 7315.1400
NOS Covered	PSC/NO133v1.0, PSC/NO132, PSC/NO134, PSC/NO135, PSC/N9901 v 1.0, LFS/N9401, LFS/N9402, LFS/N9403, LFS/N9404, LFS/N9405, LFS/N9406, LFS/N9407, LFS/N9408, LFS/N9409, LFS/N9410, CSC/N9401, CSC/N9402
NSQF Level	Level – 3
Duration of Craftsmen Training	One year (1200 hours + 150 hours OJT/Group Project)
Entry Qualification	Passed 10th class examination with Science and Mathematics or with vocational subject in same sector or its equivalent.
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, LV, DEAF
Unit Strength (No. Of Student)	16 (There is no separate provision of supernumerary seats)
Space norms	100 Sq. m
Power norms	7.5 KW
Instructors Qualification for:	
1. Mechanic Lens/ Prism Grinding Trade	B.Voc /Degree in Mechanical Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. OR 3 years Diploma in Mechanical Engineering from AICTE/recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. OR NTC/NAC passed in the trade of "Mechanic Lens/ Prism Grinding" with three years' experience in the relevant field.

	Essential Qualification: Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT. ***NOTE: - Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.***
2. Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering trades with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants NCIC in RoDA or any of its variants under DGT
3. Engineering Drawing	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the Mechanical group (Gr-I) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade

	OR Regular / RPL variants of NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT.
4. Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience **w**ith **short term ToT Course in** Employability Skills. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) **OR** **Existing Social Studies Instructors in ITIs with short term ToT Course in** Employability Skills.
5. Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOMES

1. Plan and organize the work to make job as per specification applying different types of basic fitting operation and check for dimensional accuracy following safety precaution. [Basic fitting operation – marking, Hack-sawing, Chiseling, Filing, Drilling, Taping and Grinding etc. Accuracy: ± 0.25mm]. (PSC/NO133v1.0), (PSC/NO132), (PSC/NO134), (PSC/NO135), (PSC/N9901 v 1.0)
2. Produce glass mirrors from sheet glass. [Different processes- cleaning, marking, drilling, forming, grinding, sensitizing, polishing etc. LFS/N9401
3. Perform different surface preparation- such as Silvering, Coppering, Painting of Glass mirrors Inspection and testing of Glasses and Glass mirrors. LFS/N9402
4. Prepare furniture mirror, concave and convex mirror, dentist mirror, periscope etc. LFS/N9403
5. Identify and demonstrate materials, parameters of different Lenses. LFS/N9404
6. Make Lenses and Prisms. [Different operations-Curve generation, Grinding, Smoothing, Polishing & Hand Polishing, Centering & Edging, Inspection of various parameters, Cementing of lenses, Fusion Lenses, Anti reflection coatings. LFS/N9405
7. Make spectacles lenses and carry out inspection & quality Control. LFS/N9406
8. Make Prism & other flat surfaces. [Process-Removal from block, Cleaning, Measurement of parameters, Anti-reflection coating, Cementing (if applicable. LFS/N9407
9. Surface finish on optical components by – continued Anti-reflection coatings on optics, Cementing of optical components, Silvering of Lenses and Prisms [Processes- Manufacture of front surface & back surface mirrors, Chemical silvering on optics, Vacuum deposition of different materials on optics.] LFS/N9408
10. Work with different optical instruments and devices [Telescope, Microscope, Binoculars, Periscope, Range Finder, Theodolites, Night Vision devices, Lensometer,, Auto Refractometer,, Slit refraction unit, Phoropter, Retinoscope.] LFS/N9409
11. Make various spectacles, prism & magnifying glasses. LFS/N9410
12. Read and apply engineering drawing for different application in the field of work. CSC/N9401
13. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. CSC/N9402

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Plan and organize the work to make job as per specification applying different types of basic fitting operation and check for dimensional accuracy following safety precaution. [Basic fitting operation – marking, Hack-sawing, Chiseling, Filing, Drilling, Taping and Grinding etc. Accuracy: ± 0.25mm] (PSC/NO133v1.0), (PSC/NO132), (PSC/NO134), (PSC/NO135), (PSC/N9901 v 1.0)	Plan & Identify tools, instruments and equipments for marking and make this available for use in a timely manner.
	Select raw material and visual inspect for defects.
	Mark as per specification applying desired mathematical calculation and observing standard procedure.
	Measure all dimensions in accordance with standard specifications and tolerances.
	Identify Hand Tools for different fitting operations and make these available for use in a timely manner.
	Prepare the job for Hacksawing, chiselling, filing, drilling, tapping, grinding.
	Perform basic fitting operations viz., Hacksawing, filing, drilling, tapping and grinding to close tolerance as per specification to make the job.
	Observe safety procedure during above operation as per standard norms and company guidelines.
	Check for dimensional accuracy as per standard procedure.
	Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
2. Produce glass mirrors from sheet glass.[Different processes- cleaning, marking, drilling, forming, grinding, sensitizing, polishing.etc.] LFS/N9401	Identification & Demonstration of materials of different Glasses such as soda lime glass, potash lime glass, potash led glass and common glass.
	Cleaning, Marking and cutting of glasses to different shapes such as square, rectangle, on 3 mm and 5.5 mm thick glasses.
	Drilling on plain glasses 3mm, 5 mm and 10 mm thick.
	Forming of glass for making concave mirror.
	Forming of glass for making convex mirror.
	Grinding of glasses to different profiles.
	Sensitizing of glasses.
	Polishing of glasses.
3. Perform different	Surface preparation and Silvering of Glass mirrors.

surface preparation-such as Silvering, Coppering, Painting of Glass mirrors Inspection and testing of Glasses and Glass mirrors. LFS/N9402	Coppering of Glass mirrors.
	Painting on glasses.
	Inspection and testing of Glasses and Glass mirrors.
4. Prepare furniture mirror, concave and convex mirror, dentist mirror, periscope etc. LFS/N9403	Manufacturing of furniture mirror.
	Manufacturing of concave and convex mirror.
	Manufacturing of dentist mirror.
	Manufacturing of periscope.
	Manufacturing of periscope.
5. Identify and demonstrate materials, parameters of different Lenses. LFS/N9404	Determination of Radius of curvature & Focal length of different lenses.
	Determination of power by different methods.
6. Make Lenses and Prisms.[Different operations-Curve generation, Grinding, Smoothing, Polishing & Hand Polishing, Centering & Edging, Inspection of various parameters, Cementing of lenses, Fusion Lenses , Anti reflection coatings] LFS/N9405	Practice on use of spherical block.
	Lens setting on spherical block.
	Heating pitch, placing on block with power glass (Bio-Focal), setting axis.
	Lens setting on cylindrical block Working process: (Trepanning)
	Shaping, Rubbing, finishing, and Polishing by Cerium oxide and White oxide.
	Setting Cylindrical die (Tool) Operate cylindrical m/c. /spherical m/c.
	Perform different operation viz., Curve generation, Grinding, Smoothing, Polishing & Hand Polishing.
	Practice on Centering &Edging, Inspection of various parameters, Cementing of lenses, Fusion of Lenses, Anti reflection coatings.
7. Make spectacles lenses and carry out inspection & quality Control	Perform and Select of glass moulds, Polishing & Profiling to suit in frame, Measurement of power and axis.
	Manufacturing of Bi-focal lenses and perform Transmission

LFS/N9406	measurement.
	Lens fitting on frame by grinding, edging and sizing according to the required frame. Mounting of lens in frame.
	Use of test plates /proof plates and Measurement of curvature & use of instruments (optical spherometer).
	Measurement of Focal Length for +Ve& -Ve Lenses & Mirrors.
	Practice on optical measuring devices such as 'Angle Dekkor', Lensometer, Refractometer, Spherometer, Interferometer, Strain viewer etc.
8. Make Prism & other flat surfaces. [Different Process-Removal from block, Cleaning, Measurement of parameters, Anti-reflection coating, Cementing. LFS/N9407	Practice on different operations For manufacturing of prisms and other flat surfaces.
	Remove from block then Cleaning, Measurement of parameters, Anti-reflection coating, Cementing (if applicable).
9. Surface finish on optical components by – continued Anti-reflection coatings on optics, Cementing of optical components, Silvering of Lenses and Prisms [Processes-Manufacture of front surface & back surface mirrors, Chemical silvering on optics, Vacuum deposition of different materials on optics] LFS/N9408	Manufacture front surface back surface mirrors. Perform Chemical silvering on optics, Vacuum deposition of different materials on optics.
	Perform Anti-reflection coatings on optics cementing of optical components.
	Silvering of Lenses and Prisms.
10. Work with different optical instruments and devices [Telescope,	Demonstrate & practice on application of different optical instruments and devices such as Telescope, Microscope, Binoculars, Periscope, Range Finder, Theodolites, Night Vision devices.

Microscope, Binoculars, Periscope, Range Finder, Theodolites, Night Vision devices, Lensometer, Auto Refractometer, Slit refraction unit, Phoropter, Retinoscope.] LFS/N9409	Practice Refraction equipment andits basic functions of Lensometer, Auto Refractometer, Slit lamp, Lens tray, Lens frame optical refraction unit, Phoropter Retinoscope. Idea about optical aberrations.
11. Make various spectacles, prism & magnifying glasses. LFS/N9410	Manufacture spectacles, prism & magnifying glasses.
12. Read and apply engineering drawing for different application in the field of work. CSC/N9401	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
13. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. CSC/N9402	Solve different mathematical problems
	Explain concept of basic science related to the field of study

7. TRADE SYLLABUS

SYLLABUS – MECHANIC LENS/ PRISM GRINDING			
Duration: One Year			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 165 Hrs; Professional Knowledge 30 Hrs	Plan and organize the work to make job as per specification applying different types of basic fitting operation and check for dimensional accuracy following safety precaution. *[Basic fitting operation – marking, Hack-sawing, Chiseling, Filing, Drilling, Taping and Grinding etc. Accuracy: ± 0.25mm]* Mapping NOS: (PSC/NO133v1.0), (PSC/NO132), (PSC/NO134), (PSC/NO135), (PSC/N9901 v 1.0)	1. Familiarization with Institute, administrative setup of Institute. (2 hrs.) 2. Rules & resolutions of attendance with leave facility. (2 hrs.) 3. Importance of Trade training, instruments & equipment's used. Importance of trade training, List of tools & Machinery used in the trade. (4 hrs.) 4. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). (3 hrs.) 5. First Aid Method and basic training. (1 hr.) 6. Safe disposal of waste materials like Pieces of wood, rod, stone, mud, etc. (2 hrs.) 7. Hazard identification and avoidance. (2 hrs.) 8. Safety signs for Danger, Warning, caution & personal safety message. (3	Importance of safety and general precautions required for the trade. Importance of the trade. Types of work to be done by trainees in the institute. (8 hrs)

		hrs.) 9. Preventive measures for electrical accidents & steps to be taken in such accidents. (4 hrs.) 10. Use of Fire extinguishers. (8 hr.) 11. Safe use of tools and equipments used in the trade. (4 hrs.)	
		BASIC FITTING GRINDING &BENCH WORKING: 12. Identification of different hand tools related to the trade and handling (6 hrs.) 13. Grinding of chisel.(2 hrs.) 14. Marking and sawing practice on M. S flats 6 mm thick. (45 hrs.) 15. Filing practice, simple fitting works, marking practice with steel rule, dividers and callipers (circles, areas, parallel lines). Use of Vernier calipers and Micrometer and Depth gauge. (35 hrs.) 16. Drilling different sizes of holes by hand and Machine. (7 hrs.) 17. Trepanning (format cutting) (10 hrs.) 18. Use of screw drivers, spanners, pliers, etc. -Use of Electric heater for heating glasses. -Use of various types of Tongs. (25 hrs.)	-Description of hand tools, uses, care maintenance. -Description of chisels and its application. -Description of Hacksaw &Grinding Wheels, Diamond cutter and Trepanning Tools. Hacksaw frame, blade types and application. -Files specification, description, uses, measuring standards (English, Metric units) Description of dividers, calipers, vernier calipers and Micrometer, Depth gauge uses and care & maintenance. -Familiarization of Drilling machine and uses -Drills types and operations. -Different types of Trepanning Tools & Tool Holder. -Description of screw drivers, pliers and spanners. -Description of Tongs, size, types and uses. -Glass cutting tools - Description of Diamond tipped

			cutter and wheel type cutter. (22 hrs)
Professional Skill 120Hrs; Professional Knowledge 20Hrs	Produce glass mirrors from sheet glass. [Different processes- cleaning, marking, drilling, forming, grinding, sensitizing, polishing etc.] Mapping NOS: LFS/N9401	**MAKING OF GLASS MIRRORS FROM SHEET GLASS** 19. Identify & Demonstrate of materials of different Glasses such as soda lime glass, potash lime glass, potash led glass and common glass. (10 hrs.) 20. Cleaning, Marking and cutting of glasses to different shapes such as square, rectangle, on 3 mm and 5.5 mm thick glasses. (20 hrs.) 21. Cleaning, Marking and cutting of glasses to different shapes such as step cutting and circular cutting on 3 mm and 5.5 mm thick glasses. (20 hrs.) 22. Drilling on plain glasses 3mm, 5 mm and 10 mm thick. (6 hrs.) 23. Forming of glass for making concave mirror. (12 hrs.) 24. Forming of glass for making convex mirror. (12 hrs.) 25. Grinding of glasses to different profiles. (20 hrs.) 26. Sensitizing of glasses. (8 hrs.) 27. Polishing of glasses. (12 hrs.)	-Types of glasses and commercial forms of glasses and glass materials (sheet glass and plate glass) and their uses -Important of glasses in Engineering field -Glass materials and its composition 1. Idea about 'refractive index' & 'V value" 2. Types and major classification of glass such as soda lime glass, potash lime glass, potash led glass, common glass 3. Use of glass/optic in different fields. -Defects in Glass materials & detection of defects 1. Nature of defects (i.e. air bubbles, veins, in- homogeneity etc.) 2. Adverse effects on products for these defects. 3.Instruments/ Equipments used to detect these defects. -Types of glasses such as coloured glass, bullet proof glass, fiber glass, foam glass, float glass, glass blocks, heat excluding glass, obscured glass, safety glass, shielding glass, ultra violet ray glass, wired –

			glass. Types of mirrors such as plain or straight mirror, spherical or curved mirror (concave and convex) -Glass moulding process. -Glass mould components 1. Nick ring 2. Bottle mould 3. Bottle plate -Indian standard quality specification for silvered glass mirror for general purpose and furniture mirror. -Surface preparation of glasses - polishing compounds and polishing procedure. (20 hrs)
Professional Skill 65 Hrs; Professional Knowledge 14 Hrs	Perform different surface preparation- such as Silvering, Coppering, Painting of Glass mirrors Inspection and testing of Glasses and Glass mirrors Mapping NOS: LFS/N9402	28. Surface preparation and Silvering of Glass mirrors. (22 hrs.) 29. Coppering of Glass mirrors. (22 hrs.) 30. Painting on glasses. (15 hrs.) 31. Inspection and testing of Glasses and Glass mirrors. (6 hrs.)	-Silvering of glass mirrors. -Coppering of glass mirrors -Types of paints used for painting glasses and painting procedure. -Methods of Inspection and testing of glasses and Glass mirrors. (14 hrs)
Professional Skill 65 Hrs; Professional Knowledge 14 Hrs	Prepare furniture mirror, concave and convex mirror, dentist mirror, periscope etc. Mapping NOS: LFS/N9403	32. Practice on manufacturing of furniture mirror and dentist mirror. (45 hrs.) 33. Manufacturing of concave and convex mirror (20 hrs.)	-Processes of manufacturing of furniture mirror and dentist mirror. Knowledge of manufacturing for concave and convex mirror. Safety codes and standards applicable toglass and mirror workers. Care and handling of glasses Safety appliance such as goggles, face maskh and gloves etc. (14 hrs)

Professional Skill 45 Hrs; Professional Knowledge 10 Hrs	Identify and demonstrate materials, parameters of different Lenses. Mapping NOS: LFS/N9404	34. Identification & Demonstration of materials of different Lenses. (13 hrs.) 35. Determination of Radius of curvature & Focal length of different lenses and determination of power by different methods. (32 hrs.)	A) Optical materials and its composition 1. Types of lens (glass, CR 39, polycarbonate etc.) 2. Use of optical lens in different fields B) Defects in Optical lens materials & detection of defects Nature of defects (i.e. air bubbles, veins, In homogeneity etc.) 2. Adverse effects on products for these defects. 3. Instruments/Equipments used to detect these defects. Uses of lenses and prism Reflection, Refraction Refractive Index, and Dispersion. (10 hrs)
Professional Skill 80 Hrs; Professional Knowledge 16 Hrs	Make Lenses and Prisms. [Different operations-Curve generation, Grinding, Smoothing, Polishing & Hand Polishing, Centering & Edging, Inspection of various parameters, Cementing of lenses, Fusion Lenses , Anti reflection coatings] Mapping NOS: LFS/N9405	**MAKING OF LENSES & PRISMS.** 36. Practice on use of spherical block 60 mm dia. (15 hrs.) 37. Lens setting on spherical block setting of lens. (5 hrs.) 38. Heating pitch, placing on block with power glass (Bi-Focal), setting axis. Lens setting on cylindrical block Working process: (Trepanning). (24 hrs.) 39. Shaping, Rubbing, finishing, and Polishing by Cerium oxide and White oxide. (24 hrs.) 40. Setting Cylindrical die (Tool) Operate cylindrical m/c. /spherical m/c. (12 hrs.)	Concept & understanding of the lens maker's formula, different types of lenses, focal length Vs radius of curvature, linear & angular magnification. Power of different lenses. Unit of Power (Dioptre). Different terminology related to optical lens. Defects of Lenses/images Spherical aberrations, Chromatic aberrations, Astigmatism, Coma etc. Methods of overcome aberration. Different applications of Lenses. Concept of 'A spherical Lens' for corrections spherical aberration and idea of 'Extra Dispersion

			Lens (ED)' and Polarize Glass. **Manufacture of optical components from material available in market** 1. Material in the form of glass slab/glass mould 2. Machines used in manufacture of optics (i.e. slicing, Trepanning, Milling, Curve generating, Grinding, Smoothing Polishing, Centering & edging etc. (28 hrs)
Professional Skill 100Hrs; Professional Knowledge 20Hrs	Make spectacles lenses and carry out inspection & quality Control. Mapping NOS: LFS/N9406	41. **Practice on different operations involved in manufacturing of Lenses.** (15 hrs.) - Curve generation. - Grinding - Smoothing - Polishing & Hand Polishing 42. Practice on different operations involved in manufacturing of Lenses. (8 hrs) 43. Centering & Edging Inspection of various parameters, Cementing of lenses. (6 hrs.) 44. Fusion of Lenses. (6 hrs.) 45. Anti reflection coatings. (8 hrs.)	**Manufacture of optical components from material available in market (continued)** 3. Tools & Cutters used for manufacture of Optics. 4. Abrasives and its grades used for grinding & polishing of optics. 5. Process for manufacture of lenses, prisms & other types of optical components. Description of Gala (Dammar) Types & uses in grinding of Lenses. Method of Heating pitch for fixing agents Familiarization with cylindrical block. (9 hrs)
		SPECTACLES LENSES 46. Selection of glass moulds. (2 hrs.) 47. Polishing & profiling to suit in frame. (10 hrs.) 48. Measurement of power and axis. (3 hrs.)	Method of finishing and polishing and use of cerium oxide and white oxide. Use of different abrasives of different grades Description of dies (optical glass) Types of die, sizes and

		SPECTACLES LENSES 49. Manufacturing of Bi-focal lenses. (6 hrs.) 50. Transmission measurement. (4 hrs.) **Lens fitting:** 51. Lens fitting on frame by grinding, edging and sizing according to the required frame. Mounting of lens in frame. (14hrs.) **Inspection & Quality Control** 52. Use of test plates /proof plates. (3 hrs.) 53. Measurement of curvature & use of instruments (optical spherometer) (5 hrs.) **Inspection & Quality Control** 54. Measurement of Focal Length for +Ve & -Ve Lenses & Mirrors. (3 hrs.) 55. Use of optical measuring devices such as 'Angle Dekkor', Lensometer, Refractometer, Spherometer, Interferometer, Strainviewer etc. (6 hrs.) 56. Idea about optical aberrations. (2 hrs.)	their uses Uses of cylindrical and spherical m/c. Familiarization of edging machine and uses of different types of glass moulds in accordance with polishing and profiling. Defects of eye and correction using lenses. Different parameters of spectacles. Methods of testing of parameters of spectacles. (11 hrs)
Professional Skill 45 Hrs; Professional Knowledge 10 Hrs	Make Prism & other flat surfaces. [Process-Removal from block, Cleaning, Measurement of parameters, Anti-reflection coating,	**Making Prism & other flat surfaces** 57. Practice on different operations for manufacturing of prisms and other flat surfaces. (25 hrs.)	Types of prism such as right angle prism, dispersing prism, penta prism, rhomboid prism and their applications. Principle of manufacturing of prisms & other flat surfaces

	Cementing (if applicable] Mapping NOS: LFS/N9407	- Profiling - Blocking - Grinding - Smoothing - Polishing 58. Removal from block. (3 hrs.) 59. Cleaning. (2 hrs.) 60. Measurement of parameters. (2 hrs.) 61. Anti-reflection coating. (8 hrs.) 62. Cementing (if applicable). (5 hrs.)	Parts of lens and prism. (10 hrs)
Professional Skill 65 Hrs; Professional Knowledge 14 Hrs	Surface finish on optical components by – continued Anti-reflection coatings on optics, Cementing of optical components, Silvering of Lenses and Prisms [Processes- Manufacture of front surface & back surface mirrors, Chemical silvering on optics, Vacuum deposition of different materials on optics] Mapping NOS: LFS/N9408	**Surface finish on optical components** 63. Manufacture of front surface & back surface mirrors. (9 hrs.) 64. Chemical silvering on optics. (13 hrs.) 65. Vacuum deposition of different materials on optics. (15 hrs.) 66. Anti-reflection coatings on optics Cementing of optical components. (15 hrs.) 67. Silvering of Lenses and Prisms. (8 hrs.)	Different applications of prism Blocking materials for prism making. Basic Idea about special types of optical components 1. Graticules/Reticles 2. Cylindrical Lenses 3. Bi-Prism 4. Refraction Gratings Application of silvered lenses and prism Silvering procedure (14 hrs)
Professional Skill 45 Hrs; Professional Knowledge 10 Hrs	Work with different optical instruments and devices [Telescope, Microscope, Binoculars,	**Optical instruments & devices** 68. Demonstration & practice on application of different optical instruments and devices. (10 hrs.) 69. Demonstration & practice	Tools and machines used in manufacturing of optical instruments 1. Telescope 2. Microscope 3. Binoculars

	Periscope, Range Finder, Theodolites, Night Vision devices, Lensometer,, Auto Refractometer,, Slit refraction unit, Phoropter, Retinoscope.] Mapping NOS: LFS/N9409	on application of different optical instruments and devices (18 hrs.) • Telescope • Microscope • Binoculars • Periscope • Range Finder • Theodolites • Night Vision devices 70. Use of Refraction equipments andits basic functions. (17 hrs.) • Lensometer • Auto Refractometer, • Slit lamp, • Lens tray, • Lens frame • Optical refraction unit, • Phoropter • Retinoscope. • Idea about optical aberrations	4. Periscope 5. Range Finder 6. Theodolites 7. Night Vision devices Refraction equipments and its basic functions 1. Lensometer, 2. Auto Refractometer, 3. Slit lamp, 4. Lens tray, 5.Lens frame 6. optical refraction unit, 7. Phoropter 8. Retinoscope. (10 hrs)
Professional Skill 45 Hrs; Professional Knowledge 10 Hrs	Make various spectacles, prism & magnifying glasses Mapping NOS: LFS/N9410	71. Making of spectacles. (20 hrs.) 72. Making of prism &magnifying glasses. (25 hrs.)	Methods of making for spectacles. Knowledge of Making for prism & magnifying lenses. (10 hrs)
ENGINEERING DRAWING (40 HRS.)			
Professional Knowledge ED- 40 Hrs.	Read and apply engineering drawing for different application in the field of work. Mapping NOS: CSC/N9401	Introduction to Engineering Drawing and Drawing Instruments – • Conventions • Sizes and layout of drawing sheets • Title Block, its position and content • Drawing Instrument Lines- Types and applications in drawing Free hand drawing of –	

		• Geometrical figures and blocks with dimension • Transferring measurement from the given object to the sketches. • Free hand drawing of hand tools and measuring tools. Drawing of Geometrical figures: • Angle, Triangle, Circle, Rectangle, Square, Parallelogram, Ellipse & Parabola. • Lettering & Numbering – Single Stroke. Dimensioning • Types of arrowhead • Leader line with text • Position of dimensioning (Unidirectional, Aligned) Symbolic representation – • Different symbols used in the Mechanic Lens/Prism grinding trade. Concept and reading of Drawing in • Concept of axes plane and quadrant • Concept of Orthographic and Isometric projections • Method of first angle and third angle projections (definition and difference) Reading of Job drawing related to Mechanic Lens/Prism grinding trade.
WORKSHOP CALCULATION & SCIENCE: 32 HRS.		
WCS- 32 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. Mapping NOS: CSC/N9402	**Unit, Fractions** Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, substraction, multiplication & division Decimal fractions - Addition, subtraction, multiplication & division Solving problems by using calculator **Square root, Ratio and Proportions, Percentage** Square and square root Simple problems using calculator Applications of Pythagoras theorem and related problems Ratio and proportion Ratio and proportion - Direct and indirect proportions Percentage Percentage - Changing percentage to decimal and fraction **Material Science**

		Types of Glass and Plastic materials Properties of Glass and Plastic materials **Mass, Weight, Volume and Density** Mass, volume, density, weight and specific gravity Related problems for mass, volume, density, weight and specific gravity **Heat & Temperature and Pressure** Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals Concept of pressure - Units of pressure, atmospheric pressure, absolute pressure, gauge pressure and gauges used for measuring pressure **Basic Electricity** Introduction and uses of electricity, electric current AC, DC their comparison, voltage, resistance and their units Conductor, insulator, types of connections - series and parallel Ohm's law, relation between V.I.R & related problems **Mensuration** Area and perimeter of square, rectangle and parallelogram Area and perimeter of Triangles Area and perimeter of circle, semi-circle, circular ring, sector of circle, hexagon and ellipse Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder Finding the lateral surface area, total surface area and capacity in litres of hexagonal, conical and cylindrical shaped vessels
In plant training/ Project work **Broad areas:** a) Spectacles & Prism of various sizes b) Magnifying glass of various sizes c) Optical instruments		

SYLLABUS FOR CORE SKILLS
1. Employability Skills (Common for all CTS trades) (120 Hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately inwww.bharatskills.gov.in/ www.dgt.gov.in

ANNEXURE-I

LIST OF TOOLS AND EQUIPMENT			
Mechanic Lens/ Prism Grinding (For batch of 16 Candidates)			
S. No.	**Name of the Tools& Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Steel rule	150 mm (Graduated both English and metric)	17 Nos.
2.	Outside calipers		17 Nos.
3.	Inside Calipers		17 Nos.
4.	Odd leg caliper	150 mm	17 Nos.
5.	Scriber	150x3 mm	17 Nos.
6.	Combination Pliers	150 mm	17 Nos.
7.	Goggles (fiber plastic cup) safety glasses		17 Nos.
8.	Hammer ball peinV2 lb.		17 Nos.
9.	Hand gloves leather		17 Nos.
10.	Face mask		17 Nos.
11.	Try square		17 Nos.
B. TOOLS, MEASURING INSTRUMENTS AND GENERAL SHOP OUTFIT			
25.	Hammer copper	0.50 kg	06 Nos.
26.	Oil cane		06 Nos.
27.	Drill Chuck	12 mm cap. Taper shanks	06 Nos.
28.	Diamond wheel dressing (single stone mounted)		17 Nos.
29.	Files, Hand flat	200 mm smooth	17 Nos.
30.	Files	150 mm Half round	17 Nos.
31.	Files- Triangular, Dead smooth	200 mm and 150 mm	06 Nos.
32.	Hacksaw frame	200 to 300 mm adjustable	06 Nos.
33.	Oil stone carborandum, coarse on one side and fine on the other	200x50x25 mm	17Nos.
34.	Screw Driver	200 mm	06 Nos.
35.	Screw Driver	300 mm	06 Nos.
36.	Spanner D.E. (both Metric & English)		03 sets each
37.	Fitter vice	4" Jaw (100 mm)-2 Nos.	06 Nos.

38.	Center punch	150x6 mm dia-2 Nos.	06 Nos.
39.	Chisel cold flat	12 mm -2 Nos.	02 Nos.
40.	Hand drill	6 mm-capacity	02 Nos.
41.	Drill Twist	1 mm to 12 mm, in step of 1 mm	02 Nos.
42.	Set of Morse sockets	(0-1), (1-2) and (2-3)	01 No.
43.	Fire Extinguisher	Arrange all proper NOCs and equipment from municipal / competent authorities.	As per requirement
44.	Adjustable wrench	250 mm size	04 Nos.
45.	Grease Gun		01 No.
46.	Vernier caliper	200 mm, inside and outside (graduated in inches and millimeters) least count 0.020 mm as per IS 3651	06 Nos.
47.	Wooden foldable scale metric		17Nos.
48.	Universal bevel protractor	blade range 150 and 300 mm, dial 1 degree, Vernier 5' with head, acute angle attachment	06 Nos.
49.	Micro meter outside	0 to 25 mm, least count 0.01 mm	02Nos.
50.	Micro meter outside ball type	0 to 25 mm, least count 0.01 mm	01 No.
51.	Depth Micrometer range	0 to 150 mm with 6 depth rods, least count 0.010 mm	01 No.
52.	Glass drill bit Diamond drilling bits size	5mm, 6 mm,8mm and 10 mm (consumable)	17Nos. each
53.	Glass cutter (consumable)		12 Nos.
54.	Diamond cutter		12 Nos.
55.	Circular cutter for glass cutting		06 Nos.
56.	Electric heater for heating glasses.		03 Nos.
57.	Glass plain	3 mm,5mm, 10 mm thick	As required
58.	Granite Surface Plate, grade	0, 630 x 630 x 100mm with adjustable stand	01 No.
59.	Glass Tray		04 Nos.
60.	Wash basin, Measuring Jars, Jelt Brushes and balance		01 set
61.	Glass sheet	3 mm	As required
62.	Glass sheet	5.5 mm	As required
63.	Chemical paints and Varnish		As required

C. TOOLS & EQUIPMENT FORDRAWING HALL			
64.	Drilling Machine Pillar type	0-12 capacity with motorized	01 No.
65.	Automatic beveling machine		01 No.
66.	Surface polishing machine		01 No.
67.	Bevel polishing machine		01 No.
68.	Spray gun with air compressor	with 3 HP Motor	01 No.
For Glass Spherical			
69.	Bench Grinder	250 mm dia. (Lighter type)	01 No.
70.	Spherical Generator		01 No.
71.	Two Spindle Spherical Smoother & Polisher		02 Nos.
72.	Single Spindle Hand Operator Machine		01 No.
73.	Spherical Tools (C.I. Casting)		150 Nos.
74.	Spherical Aluminum Runner		40 Nos.
75.	Thickness Glass		01 Nos.
76.	Spherometer Set (+ & -)		01 Nos.
77.	Rim less Nose plier		17 Nos.
78.	Nose plier		17 Nos.
79.	Bold Nut Nose Plier		17 Nos.
80.	CR Lens Cutter		17 Nos.
81.	Lens Drilling machine, Piller type	12 mm Capacity	01 NO.
82.	Lens Grooving machine		02 Nos.
83.	Lens Format cutting machine		02 Nos.
84.	Lens Axis Marking Chart machine		02 Nos.
85.	Lens Grinding machine Opto lab		02 Nos.
86.	Spectacle Frames - metal		24 Nos.
87.	Spectacle Frames-supra		24 Nos.
88.	Spectacle Frames-rim less		24 Nos.
89.	Spectacle Frames-shell frame		24 Nos.
90.	UV Rays detection machine		01 No.
91.	Photo chromatic detection		01 No.
92.	Polarization detection picture		01 No.
For Cylindrical			
93.	Toric Generator		01 No.
94.	Pneumatic Auto System Cylindrical Smoother & Polisher		02 Nos.
95.	Alloy Blocker		01 No.
96.	Cylinder Tools (Aluminium)		800 Nos.
97.	Cylindrical Aluminium Block		50 Nos.
98.	Torometer		01 No.
99.	Evalue Gauge	(0 - 25)	01 No.

100.	Diameter Reducer		01 No.
101.	Tap Applicator		01 No.
102.	Tool Rack		01 No.
103.	Chiller Unit (with Chiller Tank)		01 No.
104.	Thickness Gauge		01 No.
105.	Fabrication Items		As required
106.	Alloy for CR		02Kgs.
107.	Diamond for CR		01 No.
Measuring / Checking Devices			
108.	Optical Spherometer		01 No.
109.	Lenso Meter		01 No.
110.	Auto Refractro Meter		01 No.
111.	Binacular		01 No.
112.	Retinoscope		01 No.
113.	Telescope		01 No.
114.	Periscope		01 No.
115.	Microscope		01 No.
116.	Range Finder		01 No.
117.	Theodolites		01 No.
118.	Night Vision devices		01 No.
119.	Slit lamp,		01 No.
120.	Lens frame		05 Nos.
121.	Optical refraction unit (Chair unit)		01 set
122.	Phoropter		01 No.
123.	Lens Tray	plain to -20 and plain to + 20	01 set
For Spectacle Fittings			
124.	Auto edge M/C		01 No.
125.	Hand edge M/C		01 No.
WORKSHOP FURNITURE			
126.	Wooden Work bench 340x120x75 cm		04 Nos.
127.	Locker with 6 drawers (standard size)		02 Nos.
128.	Metal Rack 180x150x45cm		02 Nos.
129.	Steel almirah		01 No.
130.	Black board and easel		01 No.
131.	Instructor's Desk or table & Chair		1 set
132.	Stool		4 Nos.

Note: -

1. Internet facility is desired to be provided in the class room.

ABBREVIATIONS

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्