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

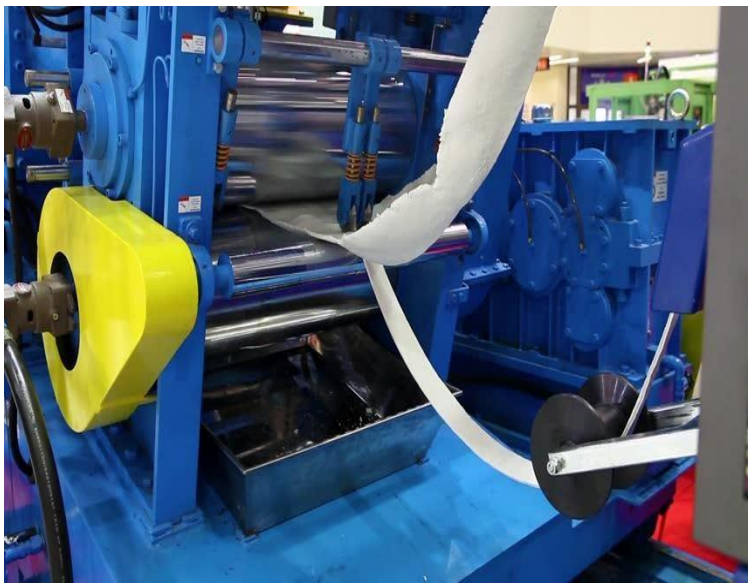
COMPETENCY BASED CURRICULUM

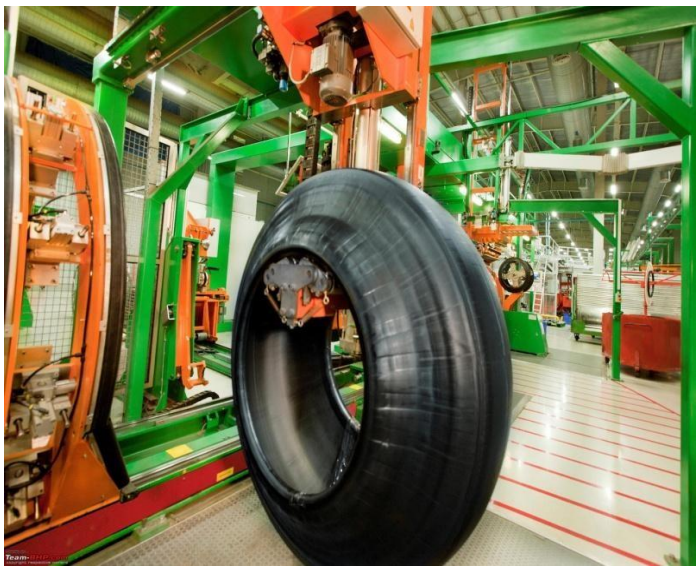
RUBBER TECHNICIAN

(Duration: One Year)
Revised in July 2022

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 3





SECTOR – RUBBER INDUSTRY

Directorate General of Training

RUBBER TECHNICIAN

(Engineering Trade)

(Revised in July 2022)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 3

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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1. COURSE INFORMATION

During the one-year duration a candidate is trained on subjects Professional Skill, Professional Knowledge, Engineering Drawing, Workshop Science & Calculation 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 broad components covered under Professional Skill subject are as below:

The trainees will observe the safety rules in the shop floor and carry out the firefighting equipment during emergencies. They will identify the rubber plantation to understand the process of Sheet making, Testing of Field Latex for Dry rubber content and total solids. They will acquaint with principal of continuous centrifuging, Creaming of Field Latex by addition of creaming agents and DRC determination of Cream latex. They will be able to apply method of preparation of Sheet Rubber, various processes of collections of Latex, Dilution, Coagulation, Sheeting & Drying and Grading of Sheet Rubber. The trainees will be able to explain the process of testing of TSR based on the specification parameters like Dirt content, volatile matter, ash, nitrogen, plasticity (P0) and Plasticity Retention Index (PRI). They will be able to take care and maintain tools, equipment and machines observing safety precautions and also identify, operate, troubleshoot & maintain different equipment used in rubber industry. The trainees will Plan and execute mixing techniques including sequence of mixing and observe he changes and find out the plasticity of this samples and prepare of rubber filler mix. Trainees will Identify, collect different types of reclaimed rubber and method to reclaim waste rubber products by powdering & heating and they will be familiar with Mixing full rubber compounding Ingredients. Determine the cure time of different rubber compounds containing different cure systems on Rheometer and cure behaviour of the compound from the Rheograph. The trainees will Prepare Blends of rubbers like NR/SBR, NR/PB etc. will identify, operate, troubleshoot & maintain different blending equipment used in rubber industry. They will prepare coagulants, dipping the former in the latex compound for the required thickness, various dipped product by using typical compound formulation for important dipped goods, moulds using plaster of Paris, compounding and molding process and finishing. They will also prepare Latex foam compound, frothing on the Hobart Mixer, transfer into the heated moulds, vulcanization, washing and drying and also prepare Tyre tread compounds using the blends. The trainee will be able to mix proper compounds and prepare the products viz. Micro cellular rubber, Mat, extruded beading, handmade hoses, paper weight, washers and injection bottle caps, gaskets, seals and various gloves and test its properties and quality. They will carry out testing for Abrasion resistance, Hardness, Swelling index, Compression resistance and Heat buildup and flexing.

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 economy/ Labour market. The vocational training programmes 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 programmes of DGT for propagating vocational training.

Rubber Technician trade under CTS is delivered nationwide through a network of ITIs. The course is of one-year duration. It mainly consists of Domain area and Core area. In the Domain area (Trade Theory & Practical) impart professional skills and knowledge, while Core area (Workshop Calculation science, Engineering Drawing and Employability Skills) impart requisite core skill, knowledge and life skills. After passing out the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Trainee broadly needs to demonstrate that they are able to:

- Read and interpret technical parameters/ documentation, plan and organize work processes, identify necessary materials and tools.
- Perform tasks with due consideration to safety rules, accident prevention regulations and environmental protection stipulations.
- Apply professional knowledge & employability skills while performing the job and modification & maintenance work.
- Document the technical parameter related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as Rubber Technician and will progress further as Senior Rubber Technician, Supervisor and can rise to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join the apprenticeship program in different types of industries leading to a National Apprenticeship Certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming an instructor in ITIs.
- Can join rubber industry.
- 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:

SL. No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	840
2	Professional Knowledge (Trade Theory)	240
5	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 are 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 the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the 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 examining 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 should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while

regard for safety procedures and practices.	undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Marks in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices.	• 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. • 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. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Junior Rubber Technician/Technical Assistant; is required to co-ordinate with team members and assist the operators/supervisors to carry out activities as per the production processes of the company. They should understand the importance of the activity/task undertaken by them in the manufacturing processes and support the operators/supervisors to ensure that set standards are achieved within the work area.

Calender Machine Operator, Rubber; operates calendering machine to convert rubber into rubber sheets by rolling process. Adjusts steam valves to regulate heat of machine rollers, judging heat by touch and by observing reaction of rubber; sets thickness gauge by turning hand-wheels; starts machine, feeds it with chunks of rubber; tests thickness of product with gauge and, if necessary, makes suitable adjustments; supervises helpers who load and unload material from machine. May attend to running repairs. May work as Calenderer, Rubberised Fabric.

Extruding Machine Operator (Rubber); operates a machine in which compounded rubber is extruded through heated die fixed to machine head to form continuous shaped strip. Selects die and fits it to machine; turns steam valve to heat die to required temperature; starts machine; adjusts machine for specified extrusion speed by means of gear lever or any other device and fixes proper-size dies to machine to get specified profile; adjusts centring screws in case of tubes, to get uniform wall thickness; feeds rubber stock into machine by hand or conveyor; verifies dimensions of extruded rubber with gauge, callipers and rubber; adjusts controls to synchronize speed of conveyor belt with speed of extrusion of rubber. May be designated according to product extruded as Inner-tube Tuber-machine Operator (Rubber tyre and tube), Hose Tuber Machine Operator (Rubber goods).

Pre and Post Calendering Operator; is responsible for feeding the correct quantity of compound to the Calender rolls.

Reference NCO-2015: -

(i) 8141.0101 – Pre and Post Calendering Operator
(ii) 8141.0300 – Extruding Machine Operator (Rubber)
(iii) 8141.0100 – Calender Machine Operator
(iv) 4322.0201 – Junior Rubber Technician/Technical Assistant

Reference NOS: RSC/N9464, RSC/N9465, RSC/N9466, RSC/N9467, RSC/N9468, RSC/N9469, RSC/N9470, RSC/N9471, RSC/N9472, RSC/N9473, RSC/N9474, RSC/N9475, RSC/N9476, RSC/N9477, RSC/N9478, RSC/N9479, RSC/N9480, RSC/N9481, RSC/N9482, RSC/N9483, RSC/N9484, RSC/N9485, CSC/N9401, CSC/N9402.

4. GENERAL INFORMATION

Name of the Trade	**RUBBER TECHNICIAN**
Trade Code	DGT/1118
NCO - 2015	8141.0101, 8141.0300, 8141.0100, 4322.0201
NOS Covered	RSC/N9464, RSC/N9465, RSC/N9466, RSC/N9467, RSC/N9468, RSC/N9469, RSC/N9470, RSC/N9471, RSC/N9472, RSC/N9473, RSC/N9474, RSC/N9475, RSC/N9476, RSC/N9477, RSC/N9478, RSC/N9479, RSC/N9480, RSC/N9481, RSC/N9482, RSC/N9483, RSC/N9484, RSC/N9485, CSC/N9401, CSC/N9402,
NSQF Level	Level – 4
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, CP, LC, DW, AA, LV, DEAF, HH, AUTISM, ID, SLD, MI
Unit Strength (No. Of Student)	24 (There is no separate provision of supernumerary seats)
Space Norms	60 Sq. m
Power Norms	5 KW
Instructors Qualification for	
1. Rubber Technician Trade	B.Voc/Degree in Rubber Technology from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in rubber technology from AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) fromDGT with two years' experience in the relevant field. **OR** NTC/NAC passed in the trade of "Rubber Technician" trade with Three years' experience in the relevant field. **<u>Essential Qualification:</u>** Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT. **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.**

1. 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
2. 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.
3. Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with **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. Observe the safety rules in the shop floor and carry out the firefighting equipmentduring emergencies following safety precautions. (NOS:RSC/N9464)
2. Compile knowledge on rubber plantation to understand the process of Sheet making,Testing of Field Latex for Dry rubber content and total solids. (NOS:RSC/N9465)
3. Explain the basic principal of continuous centrifuging, Creaming of Field Latex byaddition of creaming agents and DRC determination of Cream latex. (NOS:RSC/N9466)
4. Apply method of preparation of Sheet Rubber, various processes of collections of Latex,Dilution, Coagulation, Sheeting and Drying, Grading of Sheet Rubber. (NOS:RSC/N9467)
5. Explain the testing process of TSR based on specification parameters like Dirt content,volatile matter, ash, nitrogen, plasticity (P0), Plasticity Retention Index (PRI). (NOS:RSC/N9468)
6. Care and maintenance of tools equipments and machines observing safety precautions. (NOS:RSC/N9469)
7. Identify, operate, troubleshoot & maintain different equipment used in rubber industry. (NOS:RSC/N9470)
8. Perform the process of manufacturing of Synthetic rubbers/special rubber. (NOS:RSC/N9471)
9. Plan and execute mixing techniques including sequence of mixing and observe thechanges, find out the plasticity of the samples and preparation of rubber filler mix. (NOS:RSC/N9472)
10. Perform collection of different types of reclaimed rubber and reclaim waste rubber products by powdering and heating applying proper method. (NOS:RSC/N9473)
11. Perform mixing of full rubber compounding Ingredients. Determine the cure time of different rubber compounds containing different cure systems on a Rheometer and curebehaviour of the compound from the Rheograph. (NOS:RSC/N9474)
12. Prepare different Blends of rubbers like NR/SBR, NR/PB etc. (NOS:RSC/N9475)
13. Identify, operate, troubleshoot & maintain different equipment used in rubber industry. (NOS:RSC/N9476)
14. Prepare coagulants by dipping the former in the latex compound for the

requiredthickness. (NOS:RSC/N9477)

15. Prepare various dipped product by using Typical Compound formulation for importantdipped goods. (NOS:RSC/N9478)
16. Prepare moulds using plaster of Paris, compounding, moulding and perform finishingprocess. (NOS:RSC/N9479)
17. Prepare Latex foam compounding, frothing on the Hobart Mixer, transfer into theheated moulds, vulcanization, washing and drying. (NOS:RSC/N9480)
18. Prepare maintenance protocol for the product manufacturing machines observingsafety aspect. (NOS:RSC/N9481)
19. Prepare Tyre tread compounds using the blends.(NOS:RSC/N9482)
20. Mix proper compounds and prepare the products viz. Micro cellular rubber, Mat, extruded beading, handmade hoses, paper weight, washers and Injection bottle caps, Gaskets and seals. .(NOS:RSC/N9483)
21. Prepare various gloves and test their properties and quality. .(NOS:RSC/N9484)
22. Conduct testing for abrasion resistance, hardness, swelling index, compression resistance and heat build-up and flexing. .(NOS:RSC/N9485)
23. Read and apply engineering drawing for different application in the field of work. .(NOS:CSC/N9401)
24. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS:CSC/N9402)

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Observe the safety rules in the shop floor and carry out the firefighting equipment during emergencies following safety precautions. (NOS:RSC/N9464)	Follow and maintain working environment.
	Follow safety regulations and requirements.
	Identify personal safety equipment.
	Identify basic first aid.
	Awareness if MSDS.
2. Compile knowledge on rubber plantation to understand the process of Sheet making, Testing of Field Latex for dry rubber content and total solids. (NOS:RSC/N9465)	Inspect during latex harvesting.
	Visual inspection of collection.
	Handle and preserve latex.
	Identify the rubber plantation to making the process of sheet.
	Identify tools and equipment as per desired specifications for understand the process of marketing sheet.
	Draw and sketch a picture of latex harvestings.
3. Explain the basic principal of continuous centrifuging, creaming of Field Latex by addition of creaming agents and DRC determination of Cream latex. (NOS:RSC/N9466)	Identify basic hand tools for creaming of field latex by addition of creaming agent.
	Identify and select raw materials as per creaming of field latex by addition of creaming agents.
	Plan and prepare DRC determination of cream latex.
	Operate the product processing of skim rubber.
4. Apply method of preparation of Sheet Rubber from various collection of Latex, Dilution, Coagulation, Sheeting and Drying, Grading of Sheet Rubber. (NOS:RSC/N9467)	Choose Coagulant and its amount to be added.
	Identify different raw materials to prepare sheet.
	Prepare of various process grading of rubber.
	Identify various process of latex into dry marketable forms.
	Identify different processing of grading of rubber.
5. Explain the testing process of TSR based on specification parameters like Dirt content, volatile matter, ash, nitrogen, plasticity (P0), Plasticity Retention Index	Identify the tools and equipments to perform the job with due care and safety.
	Use plastimeter and thermo gravimetric analyser.
	Identify the desired specification for making sheet rollers & sheeting battery for ribbed smoked sheet (RSS).
	Identify the different section and use of raw materials and

(PRI). (NOS:RSC/N9468)	their function of smoke house.
	Demonstrate processing machine operation, care and use.
6. Care and maintenance of tools equipments and machines observing safety precautions. (NOS:RSC/N9469)	Identify different parts/ section its function & operation of machines/ instruments.
	Identify hand tools and their maintenance and safety precautions.
	Check the accuracy/sensitivity.
	Identify and carryout maintenance & preventive maintenance of different machines.
	Service and calibrate various types of machines.
7. Identify, operate, troubleshoot & maintain different equipment used in rubber industry. (NOS:RSC/N9470)	Brief idea gains about minor routine.
	Identify various parts and section of different equipment.
	Check the speed of response of the machines.
	Verify the characteristics of different machines used in industry.
	Study the construction, operation of the machines.
	Service and maintenance of machineries.
8. Perform the process of manufacturing of Synthetic rubbers/special rubber. (NOS:RSC/N9471)	Perform various test of synthetic rubber.
	List the manufacturers and products
	Explain the properties of synthetic rubber.
	Identify various products.
	Identify manufacturing process of different synthetic rubbers.
	Identify grading of general purpose of synthetic rubber.
	Prepare list of application of different rubbers in the form of charts.
	Identify and collect rubber products made out of synthetic rubbers.
	Perform manufacturing properties of different synthetic rubber.
9. Plan and execute mixing techniques including sequence of mixing and observe the changes, find out	Identify the principles of mixing and distributive, dispersive mixing.
	Identify the mixers and compounding equipments and their parts.

the plasticity of this samples and preparation of rubber filler mix. (NOS:RSC/N9472)	Identify principles of mix design to meet processing and vulcanization properties.
	Identify various extents on a two-roll mixing mill of different timing.
	Acquaint with the operations of the mixing mill to prepare rubber filler mix.
10. Perform collection of different types of reclaimed rubber and reclaim waste rubber products by powdering and heating applying proper method. (NOS:RSC/N9473)	Identify different raw materials.
	Understand the principle of compounding and functions of different materials.
	Identify the basic knowledge of specification standard.
	Identify heating system used in rubber industry.
	Identify concept of waste as generated during different processing stage.
	Identify different types of re-claimed rubber.
11. Perform mixing of Mix full rubber compounding Ingredients. Determine the cure time of different rubber compounds containing different cure systems on a Rheometer and curing of the compound from the Rheograph. (NOS:RSC/N9474)	Apply methods of blank preparation at various timing.
	Explain the principal of different materials.
	Ability to use plastimeter.
	Identify and select melting point/soften test for compounding ingredients.
	Identify application of polymers such as NR, SBR, PBR, NBR, CR & IIR with suspect to ageing.
	Understand basic processing and process ability.
	Ability to use rheometer and their application.
12. Prepare different Blends of rubbers like NR/SBR, NR/PB etc. (NOS:RSC/N9475)	Visually inspect raw materials.
	Identify tools & equipment as per desired specification for safe working.
	Identify different ingredients for NR/SBR, NR/PB blends.
	Prepare suitable ratio for blend rubber.
	Prepare weighing/batching systems.
	Identify construction, types and function of mastication/calendaring process.
13. Identify, operate, troubleshoot & maintain	Troubleshoot extruder operation.
	Detect the faults by troubleshooting the calendaring

different equipment used in rubber industry. (NOS:RSC/N9476)	operations.
	Care and maintenance of Mooney viscometer/ rapid plastimeter/ rheometer.
	Test and verify specific gravity and troubleshooting of mixing operation.
	Select and troubleshoot drive system for a roll mill, internal mixer systems.
	Carry out maintenance and preventive maintenance of machinery used in rubber industry.
14. Prepare coagulants by dipping the former in the latex compound for the required thickness. (NOS:RSC/N9477)	Manufacture and line major rubber products, components, their building and curing.
	Prepare dipping former in the latex compound for required thicknesses.
	Identify grading and types of NR.
	Familiar process of dipping/dipping tanks/formers/ball milling.
	Practice roll floating, roll binding and calendar gauze control devices.
15. Prepare various dipped products by using Typical Compound formulation for important dipped goods. (NOS:RSC/N9478)	Identify compounding of latex.
	Select procedure of various dipped products.
	Practice compound formulation for important dipped goods.
	Perform centrifuge.
	Manufacture balloons/gloves/rubber band/ finger caps.
	Illustrate latex concentration.
16. Prepare moulds using plaster of Paris. Compounding & moulding and perform finishing process. (NOS:RSC/N9479)	Understand the principal of casting process.
	Manufacture latex cements.
	Use coated fabrics and calendared sheeting.
	Compounding and moulding process.
	Use various rubber streaming and finishing methods.
	Use rubber to metal bonded components.
	Manufacture adhesive solvent based and aqueous systems.
	Prepare tubing weather strip and practice latex paints and coating.
17. Prepare Latex foam	Identify different raw materials and their specifications.

bycompounding, frothing on the Hobart Mixer, transfer into the heated moulds, vulcanization, Washing and drying. (NOS:RSC/N9480)	Use of Hobart mixer, vulcanization, heated modules washing and drying system.
	Process of manufacture, autoclave vulcanization, testing and quality control.
	Testing quality assessment.
	Familiar testing equipment and test methods for different designs of product.
	Apply quality control measures.
18. Prepare maintenance protocol for the product manufacturing machines observing safety aspect. (NOS:RSC/N9481)	Aware of the safe working practices.
	Operate rubber product manufacturing machineries.
	Perform working on mixing mills, moulding press and auto claves.
	Follow maintenance protocol for the product manufacturing machines.
19. Prepare Tyre tread compounds using the blends. (NOS:RSC/N9482)	Identify tyres and tubes, cycle tyres, passenger car tyres and truck tyres, tyre sizing and making.
	Get knowledge of different types of tyre construction, bias, radial & tubeless tyre, their basic feature and characteristics.
	Identify different components of tyre and their functioning.
	Select criteria of different reinforcement materials.
	Plan and prepare method of tyre building & curing, post curing treatment.
20. Mix proper compounds and prepare the products viz. Micro cellular rubber, Mat, extruded beading, handmade hoses, paper weight, washers and Injection bottle caps, Gaskets and seals. (NOS:RSC/N9483)	Familiar with mixing process.
	Identify proper compounds to prepare products like micro cellula rubber, mat, extruded beading.
	Select required raw materials tor extruded products like tubes, channels using an extruder.
	Follow safety precaution during performing various jobs.
21. Prepare various gloves and test their properties and quality. (NOS:RSC/N9484)	Acquaint with different types of gloves.
	Identify various gloves and their properties.
	Measure the dimension of various gloves.

	Knowledge about tensile properties ageing tests and dimension as per BIS.
	Study construction and operation of different types of gloves specification.
22. Conduct testing for Abrasion resistance, Hardness, Swelling index, Compression resistance. Heat build-up and flexing. (NOS:RSC/N9485)	Determine resistive and dielectric strength.
	Study effect of temperature on resilience, determination of heat buildup by Goodrich flexometer.
	Perform destructive tests, tens and abrasion resistance test, crack intention and crack growth by the de De Mattia Method.
23 Read and apply engineering drawing for different application in the field of work. (NOS: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.
24. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS:CSC/N9402)	Solve different mathematical problems
	Explain concept of basic science related to the field of study

SYLLABUS FOR RUBBER TECHNICIAN TRADE			
DURATION: ONE YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 42 Hrs.; Professional Knowledge 8 Hrs.	Observe the safety rules in the shop floor and carry out the firefighting equipment during emergencies following safety precautions.(Mapped NOS:RSC/N9464)	1. Awareness on different safety devices (safety bar, safety guard etc.) attached with different Rubber Machineries. 2. Awareness on Material Safety as Data Sheet (MSDS). 3. Introduction of trade skill and work application. 4. Familiarization with the institute and safety attitude development of the trainee by the educating them to use personal protective equipments. 5. Safe disposal of waste materials like cotton waste, grinding materials and leather cutting by hand machine. 6. Hazard identification and avoidance. 7. Preventive measures for electrical accidents & steps to be taken in such accidents. 8. Importance of trade training, list of tools & machinery used in the trade.	- Importance of trade Training. - General discipline in the Institute - Elementary First Aid. - Safety precautions - Use of different fire extinguisher - Importance of housekeeping and good shop floor practices.

		9. Safe use of tools and equipments used in the trade.	
		10. Practice on safety precautions including firefighting equipments, Accidents, First Aid practice and treatment. 11. First aid method and basic training. 12. Identification of safety signs for danger, warning caution & personal safety message. 13. Use fire extinguishers. 14. Practice and understand precaution to be followed while working in fitting jobs.	Knowledge of Safety precautions. Elementary First Aid and treatment. Knowledge of firefighting appliances.
Professional Skill 63 Hrs.; Professional Knowledge 12 Hrs.	Compile knowledge on rubber plantation to understand the process of Sheet making, Testing of Field Latex for Dry rubber content and total solids. (Mapped NOS:RSC/N9465)	15. Latex harvesting. 16. Collection, handling and preservation of field latex. 17. Calendaring. 18. Identify the rubber plantation to making the process of sheet. 19. Identify the testing of field latex for dry rubber content. 20. Plan and perform products from the rubber plantation. 21. Prepare process of product from the rubber plantation. 22. Identify and test of field latex	Rubber Tree – Its propagation, Latex Harvesting, Collection, handling and Preservation of field latex. By products from the rubber plantations.

		for dry rubber content. 23. Selection of raw materials as per testing of field latex for total solids. 24. Identify tools and equipment as per desired specifications for understand the process of marketing sheet. 25. Draw a chart showing various environmental factors. 26. Tabulate various types field latex with their properties. 27. Classify preservation of field latex resource. 28. Tabulate the different methods for conservation of field latex in different areas. 29. Draw and sketch a picture of latex harvestings. 30. Prepare the list of sources of preservation of field latex pollution with their different characteristics. 31. Visit to a preservation of field latex treatment products from the rubber plantations. 32. Make diagram of latex treatment plant with different process of products from the rubber plantation purification.	
Professional Skill 42 Hrs.;	Explain the basic principal of	33. Identify basic hand tools for creaming of field latex by	Concentration of Latex - Creaming, Creaming Agents,

Professional Knowledge 8 Hrs.	continuous centrifuging, Creaming of Field Latex by addition of creaming agents and DRC determination of Cream latex. (Mapped NOS:RSC/N9466)	addition of creaming agent. 34. Choosing creaming agents. 35. Storage and handling of materials. 36. Identify the basic principle of Centrifuging. 37. Identify and selection of raw materials as per creaming of field latex by addition of creaming agents. 38. Plan and prepare DRC determination of cream latex. 39. Visit to a latex centrifuging unit to understand the principle of centrifuging. 40. Operate the product processing of skim rubber. 41. Temperature setting.	Efficiency of Creaming, Application of Creamed Latex, Centrifuging, Centrifuging Machine, Efficiency of Centrifuging, Skim Latex, Processing of Skim. - Latex.
Professional Skill 42 Hrs.; Professional Knowledge 8 Hrs.	Apply method of preparation of Sheet Rubber, various processes of collection of Latex, Dilution, Coagulation, Sheeting and Drying and Grading of Sheet Rubber. (Mapped NOS:RSC/N9467)	42. Choose coagulant and its Amount to be add. 43. Identify various substitute materials to prepare sheet rubber. 44. Apply method of drawing, grading of sheet rubber. 45. Plan and perform various process grading of rubber. 46. Identify various process of latex into dry marketable forms.	Processing of Latex into Dry Marketable forms, RSS, Crepe, TSR (ISNR) andGrading of Rubber.
Professional	Explain the Testing	47. Use of Plastimeter.	Processing Machineries,

Skill 63 Hrs.; Professional Knowledge 12 Hrs.	process of TSR based on specification parameters like Dirt content, volatile matter, ash, nitrogen, plasticity (P0), Plasticity Retention Index (PRI). (Mapped NOS:RSC/N9468)	48. Use of thermo gravimetric analyser. 49. Identify tools and equipment as per desired specification for making sheet rollers & sheeting battery for Ribbed Smoked Sheet (RSS). 50. Selection of materials as per applications. 51. Visual inspection of raw material for rusting, scaling, corrosion etc. 52. Familiar with processing machine operation, care and use. 53. Identify and use of various types/size of sheet rollers & sheeting battery for ribbed smoked sheet (RSS). 54. Identify different section and use of raw materials and their function of smoke house. 55. Prepare and practice initial size reduction machines for rubber coagulum. 56. Familiar with processing machines in hammer mills section, care and use. 57. Identify and use different machinery to process different types of marketable forms of natural rubber in creepers. 58. Plan and perform different types of shredders dryer and their use to processing	Details regarding the machinery used to process different types of marketable forms of Natural Rubber. – A. Sheet Rollers& Sheeting Battery for Ribbed B. Smoked Sheet (RSS) Smoke House Creepers C. Initial Size D. Reduction machines for E. Rubber coagulum Hammer Mills Drier –Different types

		machinery.	
Professional Skill 21 Hrs.; Professional Knowledge 4 Hrs.	Care and maintenance of tools equipments and machines observing safety precautions. (Mapped NOS:RSC/N9469)	59. Care and maintenance of hand tools and machines. 60. Dismantling, reconditioning, checking, replace parts of various machines. 61. Service and calibrate various types of machines/ instruments. 62. Identify and carry out maintenance and preventive maintenance of different machines. 63. Identify different parts/ section its function & operation of machines/ instruments.	Common hand tools used by a Rubber Technician. Their kinds, uses and materials from which they are made. Their names and functions.
Professional Skill 21 Hrs.; Professional Knowledge 4 Hrs.	Identify, operate, troubleshoot & maintain of different equipment used in rubber industry. (Mapped NOS:RSC/N9470)	64. General maintenance of machines - Brief idea about minor routine maintenance and safety aspect and study of different Equipment. 65. Identify various types of instrument/machine contraction. 66. Identify various parts and section of different equipment used in rubber industry. 67. Check the accuracy precession, sensitivity of machines. 68. Check the speed of response machines. 69. Select and verify characteristics of machines.	Rubber - its different sections, their suitability for different purposes. Centrifuging Machine, efficiency of centrifuging machine.

		70. Service and maintenance of machines. 71. Study the construction, operation of the machine. 72. Identify and carry out maintenance and preventive maintenance.	
Professional Skill 63 Hrs.; Professional Knowledge 13 Hrs.	Perform the process of manufacturing Synthetic rubbers/special rubber. (Mapped NOS:RSC/N9471)	73. Perform various tests of synthetic rubber. 74. List out the manufacturers. 75. List out the products. 76. Study the properties of synthetic rubber. 77. Study the properties of special purpose rubber. 78. Identify products. 79. Identify different types of synthetic rubbers used in general purpose. 80. Identify manufacturing process of different synthetic rubbers like BSR/Poly butadiene (BR), butyl rubber. 81. Identify grading of General-purpose synthetic rubbers. 82. Tabulate a comparison of properties with natural rubber. 83. Identify the manufacturers of synthetic rubber in India and overseas. 84. Prepare list of applications of	General Purpose Synthetic Rubbers – SBR, properties, Comparison of, Poly butadiene(BR), Butyl Rubber, grades, trade names, Manufacturing Process properties with Natural Rubber and - Application of these rubbers in products. - Special purpose Synthetic Rubber- Poly chloroprene rubber (CR), Silicone Rubber, Nitrate Rubber (NBR), Ethylene Propylene Diane. - Rubber (EPDM), Poly Urethane Rubbers (PU). - Techniques of vulcanization.

		different rubber as chart. 85. Identify testing equipments and test methods (Develop for different styles and designs of rubber.) 86. Identify and collect rubber products made out ofthis rubber. 87. Identify manufacturing properties of different synthetic rubber like poly chloroprene rubber (CR), silicon rubber, nitrate rubber (NBR). 88. Ethylene propylene dlane rubber (EPDM), Poly Urethane rubbers (PU).	
Professional Skill 21 Hrs.; Professional Knowledge 4 Hrs.	Plan and execute mixing techniques including sequence of mixing and observe he changes, find out the plasticity of the samples and preparation of rubber filler mix. (Mapped NOS:RSC/N9472)	89. Mastication by calendaring/two roll mixing mill. 90. Identify the principles of mixing and distributive and dispersive mixing. 91. Identify the mixers and compounding equipments and their parts like open mills, internal mixers, mixing energy, practical mixing, techniques including sequence of mixing and evolution of quality of mixing. 92. Identify principals of compounding, compounding ingredients and mix design to meet processing and	Principles of Rubber compounding, Mastication, Compounding Ingredients, Definition and Objectives. Activators, Stearic Acid, Zinc oxide, Fillers, Black & Non-Black Fillers, Plasticizers.

		vulcanisate properties. 93. Identify various extent on a two-roll mixing mill of different timing and observe the changes and find out the plasticity of this samples. 94. Acquaint with the operation of the mixing mill to prepare of rubber, filler mix.	
Professional Skill 21 Hrs.; Professional Knowledge 04 Hrs.	Perform collection of different types of reclaimed rubber and reclaim waste rubber products by powdering and heating applying proper method. (Mapped NOS:RSC/N9473)	95. Familiar with different raw materials. 96. Understand the principal of compounding and functions of different materials, accelerators, fillers, cross linking agents and other rubber chemicals. 97. Identify the basic knowledge of specification, standards and testing of different raw materials and their significance in rubber industries. 98. Identify heating systems used in rubber industry and their applications and suitability. 99. Identify concept of waste as generated during different processing stage and avenue for them reused and cost optimization. 100. Identify different types of reclaimed rubber and their grades.	Ensure proper functioning of mixing mill. Accelerators, CuringAgents and Special compounding Ingredients Blowing Agents, Factice, Colours.
Professional	Perform mixing of	101. Apply methods of blank	Vulcanization – understanding

Skill 63 Hrs.; Professional Knowledge 13 Hrs.	full rubber compounding Ingredients. Determine the cure time of different rubber compounds containing different cure systems on Rheometer and curing of the compound from the Rheograph .(Mapped NOS:RSC/N9474)	preparation various timing and finishing methods. Understand on the principal of different materials, accelerators, curing agents and special compounding, blowing agents, rubber substitute (factice), colours. 102. Ability to use of plastimeter. 103. Identify and select of melting point/softening point test for compounding ingredients and their specifications. 104. Identify techniques of mix full rubber compounds. 105. Identify principle of mix design and selection and application of polymers such as NR, SBR, PBR, NBR, CR & IIR with suspect to ageing. 106. Understand the principle of basic processing operation and process ability. 107. Ability to use rheometer and their application in process control including description of such equipments. 108. Study and analyse the cure time. 109. Identify different cure systems on a Rheometer.	the process. Cure time, Scorch time, and Reversion. Vulcanization Methods.

		111. Identify practical mixing techniques including sequence of mixing and evaluate of quality of mixing (specific gravity and Rheograph). 112. Use of Rheometer. 113. Study and analyse the cure time.	
Professional Skill 42 Hrs.; Professional Knowledge 8 Hrs.	Prepare different Blends of rubbers like NR/SBR, NR/PB etc. (Mapped NOS:RSC/N9475)	114. Identify and use different ingredients to prepare NR/SBR, NR/PB etc. blends. 115. Blend rubber with suitable ratio. 116. Prepare weighing/batching system. 117. Ability to use mastication / calendaring process.	Blends of Rubbers – Advantages & Dis-advantages, Thermo Plastic - Elastomers. Simple methods of production. Advantages & Disadvantages.
Professional Skill 21Hrs.; Professional Knowledge 4 Hrs.	Identify, operate, troubleshoot & maintain of different equipment used in rubber industry. .(Mapped NOS:RSC/N9476)	118. Familiar with the features of design and construction of machinery used, including ancillary equipment (e.g. feed and take –off system, drive system, temperature and pressure measuring devices. 119. Care and maintenance of Mooney viscometer, rapid plastimeter, rheometer and their application in process control observing safety precaution. 120. Identify, test and verify specific gravity and	Manufacture of Latex products – Dipping, Dipping Tanks, Formers,Coagulants, Ball Milling.

		rheograph troubleshooting of mixing operation and post mixing operation. Detect the faults and troubleshooting of calendaring operation, moulding operation and extruder operation. 121. Identify, select and troubleshooting of drive system for a roll mill, internal mixer and haul-off systems. 122. Identify and carryout maintenance and preventive maintenance of machinery used in rubber industry. 123. Application of cleaner. 124. Prepare a coagulant.	
Professional Skill 21 Hrs.; Professional Knowledge 4 Hrs.	Prepare coagulants by dipping the former in the latex compound for the required thickness. (Mapped NOS:RSC/N9477)	126. Identify & manufacture outline of major rubber products, involving the materials, components their building and curing. 127. Plan and prepare cleaning of formers (Wood, Porcelain) of coagulants. 128. Plan and prepare Dipping former in the latex compound for the required thickness. 129. Identify various types of NR Latex and their grades.	Compounding of Latex for various Dipped products.

		130. Identify the process of dipping, dipping tanks, formers, ball milling. 131. Identify roll floating, roll binding and calendar gauze control devices.	
Professional Skill 42 Hrs.; Professional Knowledge 8 Hrs.	Prepare various dipped product by using Typical Compound formulation for important dipped goods. (Mapped NOS:RSC/N9478)	132. Identify various dipped goods. 133. Compound Latex for various Dipped products. 134. Prepare typical formulation for important dipped goods like: - Gloves, Balloons, Rubber bands, Condoms, Elastic thread. 135. Produce Balloons, Gloves, Rubber Bands and Finger Caps. 136. Perform Centrifuge. 137. Apply the method of Latex concentration. 138. Follow safety precaution during performing various jobs.	Typical Compound formulation for important dipped goods like: - Gloves, Balloons, Rubber bands, Condoms, Elastic thread.
Professional Skill 42 Hrs.; Professional Knowledge 8 Hrs.	Prepare moulds using plaster of Paris. Compounding &molding and perform finishing process. (Mapped NOS:RSC/N9479)	139. Use mathematics as a tool to solve problems related to process parameter on product like casting process, moulding process and finishing. 140. Plan and prepare casting process for ex-toys. 141. Identify the coated fabrics and calendered sheeting. 142. Prepare of moulds using	Casting process. Ex- Toys etc. Manufacture of Latex cements and adhesives, Latex paints and coatings.

		plaster of Paris. 143. Identify moulded items like seals, gaskets and auto components. 144. Identify compound and moulding materials and their process. 145. Prepare various rubber streaming and finishing methods. 146. Identify rubber to metal bonded components like engine mounting and rubber roller. 147. Plan and prepare manufacture of latex cements and adhesive like solvent based and aqueous systems. 148. Study extruded items like tubing, weather strip. 149. Prepare and practice latex paints and coatings.	
Professional Skill 42 Hrs.; Professional Knowledge 8 Hrs.	Prepare Latex foam by compounding, frothing on the Hobart Mixer, transfer into the heated moulds, vulcanization, washing and drying. (Mapped NOS:RSC/N9480)	150. Use of Hobart Mixer. 151. Ensure the processes to be done. 152. Identify standards and testing of different raw materials and their specification in rubber industry. 153. Use and care of Hobart mixer, vulcanization, heated modules washing and drying system. 154. Prepare of latex foam	Manufacture of Latex foam. Process of manufacture: - 1. Dunlop process 2. Talalay process. Machinery details of process, Moulds, Autoclave, - Vulcanization, testing and quality control.

		compounding for thing on the Hobart Mixer to meet processing and vulcanizate properties. 155. Identify the principal of washing and drying processing system. 156. Identify manufacture of latex foam process like Dunlop process, talalay process. 157. Construct and operate machinery details of process modules, autoclave vulcanisation. 158. Testing and quality assessment. 159. Identify testing equipment and test methods for different designs of produce/ manufacture. 160. Plan prepares and role of quality control.	
Professional Skill 21 Hrs.; Professional Knowledge 4 Hrs.	Prepare maintenance protocol for the product manufacturing machines observing safety aspect. (Mapped NOS:RSC/N9481)	161. Identify various Rubber product manufacturing machineries. 162. Identify working of various Rubber product manufacturing machineries. 163. Prepare maintenance protocol for the product manufacturing machines. 164. Prepare maintenance protocol. 165. Identify the mechanism of	Rubber product manufacturing machineries: - A. Mixing Mills B. Internal Mixers C. Calenders D. Extruders E. Moulding Press F. Auto claves.

		working and safety aspects.	
Professional Skill 42 Hrs.; Professional Knowledge 8 Hrs.	Prepare Tyre tread compounds using the blends. (Mapped NOS:RSC/N9482)	166. Identify the types of tyres (2 wheelers, LCV, Truck, Earth Mover). 167. Use of different tyres. 168. Measure various tyres in terms of its dimensions. 169. Test Hardness of different tyres. 170. Identify different types of tyre constructions like bias, radial & tubeless tyres. 171. Identify Basic feature and characteristics of different types of tyre. 172. Identify different components of tyres and their functioning. 173. Select criteria of different reinforcement materials. 174. Apply the method of tyre building & curing.	Dry Rubber products:-Tyres – Tyre Industry in India Manufacture of Automobile Tyres, tubes etc. Different types of Tyre. Manufacture of Cycle Tyre, tubes. Retreading of Tyres. Pre- cured retreads.
Professional Skill 42 Hrs.; Professional Knowledge 8 Hrs.	Mix proper compounds and prepare the products viz. Micro cellular rubber, Mat, extruded beading, handmade hoses, paper weight, washers and Injection bottle caps, Gaskets and seals. (Mapped NOS:RSC/N9483)	175. Identify proper compounds to prepare products like Micro cellular rubber, Mat, extruded beading etc. 176. Mix proper compounds to prepare products like Micro cellular rubber, Mat, extruded beading etc. 177. Prepare the following	Non tyre products-Compounding and manufacturing methods. Mats, Hot water bags, micro cellular rubber, Play balls, Gaskets and seals, calendared sheets, rubber tometal products, rubber coated textile, rubber hoses, rubber beltings, rubber lining for chemical plants, rubber covered rollers,

		products: - Micro cellular rubber, Mat, extruded beading, handmade hoses, paper weight, washers and Injection bottle caps, Gaskets and seals. 178. Select/add of blowing agent. 179. Apply curing procedure. 180. Identify various moulds. 181. Identify and select required raw material to prepare extruded products like tubes, channels using an extruder. 182. Prepare extruded products like tubes, channels using an extruder. 183. Follow safety precaution during performing various jobs.	extruded Products.
Professional Skill 21 Hrs.; Professional Knowledge 4 Hrs.	Prepare various gloves and test their properties and quality. (Mapped NOS:RSC/N9484)	184. Acquaint with different types of Gloves. 185. Test Gloves, Tensile properties, ageing tests, dimensions as per BIS. 186. Test of gloves like- • Elongation test • Wall thickness test • Air test • Water leak test • pH-value 187. Measure the dimensions of various gloves. 188. Test specification for	Testing of rubber products – Latex products -- physical & chemical properties of fresh latex. Specification tests for centrifuged latex &Technically Specified Rubber. Principles of testing of elastomer vulcanizates, stress- strain properties, shear, compression set, flux resistance, Abrasion, hardness, swelling insolvents, ageing tests.

		different types of Gloves.	
Professional Skill 42 Hrs.; Professional Knowledge 8 Hrs.	Conduct testing for Abrasion resistance, hardness, swelling index, Compression resistance. Heat buildup and flexing. (Mapped NOS:RSC/N9485)	189. Identify standard test methods like limitation of test data, precision and accuracy. 190. Plan and prepare validity of test method like quality assurance elements of statistical quality control mean, average, medium, variance, standard deviation. 191. Use mathematics as a tools to solve problem related to testing such as tensile strength resilience, resistivity. 192. Identify and select various test of abrasion test harness ad compression resistance. 193. Check the accuracy precision of hit build-up and flexing system. 194. Verify specification about BIS and ISO standards on rubber, rubber chemicals and rubber-based products.	Standards and specifications, knowledge about Bureau of Indian Standards (BIS), BIS standards for few typical rubber products.
		195. Acquaint with the formulation for common rubber products. 196. Build up the capability for designing formulation for common rubber products. 197. Prepare various common	Design and development of rubber products, Basic understanding on the formulation of rubber products, Dosages and criteria for selection.

		rubber products. • Formulation • Weighing • Addition of ingredients • Mould setting • Temperature setting • Curing. 198. Assess the quality of the prepared rubber products.	
Engineering Drawing (40 Hrs.)			
Professional Knowledge ED- 40 Hrs.	Read and apply engineering drawing for different application in the field of work. (Mapped NOS:CSC/N9401)	**Engineering Drawing:** 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 freehand sketches. • Free hand drawing of hand tools and measuring tools. Drawing of Geometrical figures: • Angle, Triangle, Circle, Rectangle, Square, Parallelogram. • Lettering & Numbering – Single Stroke. Dimensioning • Types of arrowhead • Leader line with text • Position of dimensioning (Unidirectional, Aligned) Symbolic representation – • Different symbols used in the related trades. 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 (definitionand difference) Reading of Job drawing of related trades.	
WORKSHOP CALCULATION & SCIENCE (38 Hours)			

WCS- 38 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (Mapped NOS:CSC/N9402)	**Workshop Calculation & Science:** **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, subtraction, 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 **Mass, Weight, Volume and Density** Mass, volume, density, weight and specific gravity Related problems for mass, volume, density, weight and specific gravity **Speed and Velocity, Work, Power and Energy** Work, power, energy, HP, IHP, BHP and efficiency **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, ~~molecule, atom, how electricity is produced~~, electric current AC,DC their comparison, voltage, resistance and their units **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 **Levers and Simple machines** Simple machines - Effort and load, mechanical advantage, velocity ratio, efficiency of machine, relationship between efficiency, velocity ratio and mechanical advantage

		Trigonometry Measurement of angles Trigonometrical ratios Trigonometrical tables
In-plant training/ Project work		

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

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

LIST OF TOOLS AND EQUIPMENT			
RUBBER TECHNICIAN (For batch of 24 candidates)			
S No.	**Name of the Tool &Equipment**	**Specification**	**Quantity**
A. TOOLS AND EQUIPMENT			
1.	Weighing Balance - Electronic	Capacity: 1000g Readability: 0.01 g Repeatability ± 0.01 g Linearity ± 0.02 g Pan size (mm): 125	05 Nos.
2.	Common Balance	With weights in the ratio 1:2:2:5 measurable up to 10KG	02 Nos.
3.	Platform Balance	Capacity: 60kg Accuracy: 5gm Platters Size: 500 × 500mm Display: LED	01 Nos.
4.	Water Bath –Lab size	6 holes with digital temperature control, thermostatic control with an accuracy of ± 5ºC	02 Nos.
5.	Hot Air Oven – 0 to 2000 C	Size in Inch: 18” X 18”X18” Temp.: Ambient to 200° CInner SS Outer powder coated Digital Temperature Control, Thermostatically Temperature Control	02 Nos.
6.	Wallace Plastimeter	Plastimeter 306mm(w) x 353mm(d) x306mm(w) Specimen cutter dimensions 380mm(d) x 80 mm(w) Weight of plasimeter :34kg Platen sizes:10mm,7.3mm,14 mm diameter Standards:BS903: Pt A59: section A59.1:1997ISO2007:1991 Platen temp. P14/1,2,3 :1000C Plarentemp. P14/VT:600C-1800C	01 No.
7.	Infra-Red Heater	BTU Output :5200 Heating :1000 Capacity (sq. Ft) Volts :120	02 Nos.

		Amps :12.5, Watts :1500 Blower included: Yes Heat settings: Variable Thermostat included: Yes Power cord: 06 ft. Plug type ;3-prong Receptacle type required: Standard Remote Included: Yes. Thermal cut off safety device: Yes Tip –over safety switch: yes Dimension W x D x H 14 3/8 x 19 ¾ x17 3/4 Manufacturer warranty :3YRS Ship weight ;49.76 lbs.	
8.	Sheeting Rollers and batteries	With 1hp single motor, Roller with 610mm, 4 pairs, Dimension in meter 1.4Lx1.07wx0.96H	02 Nos.
9.	Latex Creaming Tank	Standard	01 No.
10.	Ball Mill	Speed of bucket- 24rpm, Speed of opening>25mm, Size of outputting feed 0.075-.1mm, Power 100Kw	01 No.
11.	Ball Milling jar	Small size/ steel	04 Nos.
12.	Latex Dipping Tank (Steel)	Small size/ steel	01 No.
13.	Coagulant Tank	Small size/ steel	01 No.
14.	Formers for Household Gloves	Wood or Porcelain	12 Pairs
15.	Formers for Electricians Gloves	Wood or Porcelain	12 Pairs
16.	Formers for Surgical Gloves	Wood or Porcelain	12 pairs
17.	Formers for Balloons	Wood or Porcelain	12 Nos.
18.	Formers for Rubber Band	Wood or Porcelain	12 Nos.
19.	Formers for Finger Caps	Wood or Porcelain	12 Nos.
20.	Casting Moulds	Plaster of Paris or Aluminum	12Nos.
21.	Hobart Mixer	N-50, 5-quart mixer, 1/6-H.P. Hobart-designed fixed-speed motor	01 No.
22.	Foam Mould	Small size, For Small cushion	02 Nos.

23.	Autoclave	AUTOCLAVE VERTICAL DIA X HEIGHT: 300x500 mm. (12'X20") LOAD: 2.0 KW I) OUTER M. S. DELUXE S.S. 600 amps	01 No.
24.	Rubber Band Cutting Machine	Manually Operated i) Hydraulic Operated ii) Screw type with Hand Wheel Toggle type	01No.
25.	Calendar	3 rolls, roll with 8", with antifriction bushing, fail safe system with Special accessories suchas, strip cutting knife, roll temperature control system, hinged or motorized side shields	01No.
26.	Extruder – Lab size	Size 1", L/D Ratio.1:4.5 Worm R.P.M. 40, Capacity (app.)5 K.G./H. R, Electric Motor 2 H. P.	01No.
27.	Rheometer	System should measure Rheological properties Torque Range: 0.05µNm to 200mNm	01No.
28.	Two Roll Mill –Size (6 x 12 inch)	Roll dia-250mm, Barrel length 600mm, Batch cap-8-9KG, 15HP, Gear 10:1/50:1	01No.
29.	Moulds for Cellular Sheet	For small size specimen/standard	01No.
30.	Moulds for Play Ball (Multi Cavity)	For small size specimen/standard	02Nos.
31.	Moulds for Table Mat (Multi Cavity)	For small size specimen/standard	01 No.
32.	Metal Moulds for Injection Bottle Caps (Multi cavity)	For small size specimen/standard	01No.
33.	Hydraulic Press (Moulding Press)	Capacity-1ton, Platen size-250x250mm, Ramdia 150mm, Ram stroke-100mm, Electric	01No.
B. RAW MATERIALS			
34.	Aluminum Pans	4 ltr capacity	12 Nos.
35.	Glass Beaker	1000 ml capacity	5 Nos.
36.	Glass Beaker	500 ml capacity	16 Nos.
37.	Glass Beaker	250 ml capacity	16 Nos.

38.	Glass beaker	100 ml capacity	25 Nos.
39.	Glass Beaker	50 ml capacity	16 Nos.
40.	Conical Flask	250 ml	24Nos.
41.	Conical Flask	100 ml	16 Nos.
42.	Funnels	Small, Medium and Big size	16 Nos.
43.	Burette	50 ml	16 Nos.
44.	Burette	100 ml	16 Nos.
45.	Pipette	20 ml	16 Nos.
46.	Pipette	10 ml	16 Nos.
47.	Burette Stand	---	16 Nos.
48.	Glass rods for stirring	long and short	24Nos. each
49.	Hot plate	Plate size 6x6” Overall size8x8” 1ph, 240 volt	03 Nos.
50.	Formic Acid	-----	05 liters
51.	Acetic Acid	-----	05 liters
52.	Natural rubber	-----	25 kg
53.	SBR	-----	25 kg
54.	PBR	-----	25 kg
55.	IIR	-----	25 kg
56.	Silicone Rubber	-----	25 kg
57.	Nitrile Rubber	-----	25 kg
58.	EPDM	-----	25 kg
59.	Sulphur	-----	25 kg
60.	Zinc Oxide (Activators)	-----	*12 kg
61.	Stearic Acid (Activators)	-----	*12 kg
62.	CBS (Accelerator)	-----	02 kg
63.	TMT (Accelerator)	-----	02 kg
64.	MBTS (Accelerator)	-----	02 kg
65.	Clay	-----	25 kg
66.	Carbon black	-----	25 kg
67.	MC crump	-----	100 kg
68.	Reclaimed Rubber	-----	50 kg

Note:-

1. Internet facility is desired to be provided in the classroom.

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