



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

COMPETENCY BASED CURRICULUM

TEXTILE MECHATRONICS

(Duration: Two Years)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 5



**SECTOR – INDUSTRIAL AUTOMATION &
INSTRUMENTATION**

TEXTILE MECHATRONICS

(Engineering Trade)

(Revised in 2018)

Version: 1.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 5

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Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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1. COURSE INFORMATION

During the two-year duration of Textile Mechatronics trade a candidate is trained on professional skill, professional knowledge, Engineering Drawing, Workshop Calculation & Science and Employability skill. In addition to this a candidate is entrusted to undertake project work, industrial visit and extracurricular activities to build up confidence. The broad components covered related to the trade are categorized in four semester of six months duration each. The semester wise course coverage is categorized as below:-

1st Semester – In the first semester, the trainees will select and perform electrical / electronic measurement of single range meter & perform panel wiring using cable, connectors, protective devices and test functionality. They will be able to test & service different cells and construct different electrical sub system and measure parameters and install various control wiring system. They will construct, verify characteristics of electrical and magnetic circuits and measure power and energy with load. They will also execute testing, identify terminal and maintenance of alternator, AC Motors, Transformer and Starters. Plan and prepare earthing insulation. They will plan and execute electrical illumination system and detect faults in rectifier and service of different domestic and industrial appliances, soldering and desoldering of various electronic and industrial appliances. They will test and verify the input/output characteristics of various analog and power electronic circuits and analyze the circuit functioning. Construct test and verify the input/output characteristics of various analog and power electronic circuits and analyze the circuit functioning. Construct a programme and verify different digital logic circuits and timer circuits using 555 IC's, simple programme on microprocessor and PLC.

2nd Semester – In the Second semester, the trainees will perform basic workshop operation of different manufacturing sections, methods and identify different components. They will be able to check different electrical wiring & winding methods of different electrical sub system. They will identify different Hydraulic & pneumatic applications in textile machines, different motors, sensors and transducers applications in textile.

3rd Semester – In the third semester, the trainees will identify different components of yarn preparatory machine for its maintenance; Check different components of knitting & weaving machine for its maintenance. They will identify different components of Handloom & Power loom Turning for its maintenance, Check different Pneumatic Automation & control In Textile Machines. They will be able to simulate electro-pneumatic systems involving pneumatic controls & apply Advanced Automation System in Textile industries.

4th Semester – In the fourth semester, the trainees will identify different HMI panels in textile industries & their applications; Check different flat /circular knitting machine for maintenance. They will check different production methods, machine maintenance & quality control concepts in Industry.



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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 National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programs of NCVT for propagating vocational training.

Textile Mechatronics Trade under CTS is delivered nationwide through network of ITIs. The course is of two years (04 semester) 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 NCVT which is recognized worldwide.

Candidates need broadly to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, 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 knowledge, core skills & employability skills while performing the job and repair & maintenance work.
- Check the job with circuit diagrams/components as per drawing for functioning, diagnose and rectify faults in the electronics components/module.
- Document the technical parameters in tabulation sheet related to the task undertaken.

2.2 CARRIER PROGRESSION PATHWAYS:

- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.

2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two-years (04 semesters): -

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	2266
2	Professional Knowledge (Trade Theory)	528
3	Workshop Calculation & Science	176
4	Engineering Drawing	264
5	Employability Skills	110
6	Library & Extracurricular Activities	176
7	Project Work	320
8	Revision & Examination	320
	Total	4160

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of the course and at the end of the training program as notified by the Government of India (GoI) from time to time. The employability skills will be tested in the first two semesters itself.

a) The **Internal Assessment** 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 an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

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

2.4.1 PASS REGULATION

The minimum pass percentage for practical is 60% & minimum pass percentage of theory subjects is 40%. For the purposes of determining the overall result, 25% weightage is applied to the result of each semester examination.

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 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

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examining body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage 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 regard for safety procedures and practices	<ul style="list-style-type: none"> • Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • Below 70% tolerance dimension achieved while 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) Weightage 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	<ul style="list-style-type: none"> • Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% tolerance dimension achieved while undertaking different work with those

procedures and practices	<p>demande by the component/job.</p> <ul style="list-style-type: none"> • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Weightage in the range of more than 90% to be allotted during assessment	
<p>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.</p>	<ul style="list-style-type: none"> • High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% tolerance dimension 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.





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Textile Mechatronics; are generalized trade-technician workers. Textile Mechatronics technicians will usually assist design, development and engineering staff, as well as working closely with other trades persons to install, maintain, modify and repair Textile Mechatronics systems, equipment and component parts.

Technician Mechatronics may

- Fit and assemble parts and sub-assemblies made from electrical - electronic and computer components.
- Install, modify, repair and fault-find mechanical, hydraulic and pneumatic equipment and systems & sub systems.
- Set up, inspect, adjust & operate various textile machines and equipment and make repairs.
- Erect textile machinery and equipment on site.
- Examine detailed drawings or specifications to find out job, material and equipment requirements.
- Cut, thread, bend and install hydraulic and pneumatic components.
- Dismantle faulty tools and assemblies and repair or replace defective parts.
- Check accuracy and quality of finished parts, tools or sub-assemblies.

Textile Mechatronics technicians build automated systems for Textile industry. It involves mechanics, electrical-electronics, hydraulics, pneumatics and computer technology. The computer technology element covers information technology applications, programmable machine control systems and technology which enable communication between machines, equipment and people.

In addition Textile Mechatronics have the ability to visualize the job, good coordination, mechanical attitude, manual dexterity and perform work related mathematical calculations.

Plan and organize assigned work and detect and resolve issues during execution. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

May be designated as “Textile Mechatronics” according to nature of work done in Textile Industry.

Reference NCO-2015:

- a) 7233.0101 - General Maintenance Fitter - Mechanical
- b) 7412.0101 - Automation Specialist
- c) 7412.0201 - Fitter-Electrical and Electronic Assembly
- d) 7421.0300 - Electronics Mechanic
- a) 7311.0400 – Mechanic Precision Instrument, Mechanical

4. GENERAL INFORMATION

Name of the Trade	TEXTILE MECHATRONICS
NCO - 2015	7233.0101, 7412.0101, 7412.0201, 7421.0300, 7311.0400
NSQF Level	Level -5
Duration of Craftsmen Training	2 Years (4 Semesters each of six month duration)
Entry Qualification	Passed 10 th class examination under 10+2 system of education with Science and Mathematics or its equivalent.
Unit Strength (No. Of Student)	20 (Max. supernumeraries seats: 6)
Space Norms	240 Sq. m
Power Norms	9 KW
Instructors Qualification for	
1. Textile Mechatronics Trade	<p>Degree in Textile Mechatronic from recognized Engineering College/ University with one year post qualification experience in relevant field OR Diploma Textile Mechatronic from recognized board of Technical Education with two years post qualification experience in relevant field. OR NTC / NAC passed in Textile Mechatronic Trade with 3 years post qualification experience in the relevant field.</p> <p>Desirable: - Preference will be given to a candidate with CIC (Craft Instructor Certificate) in the trade.</p> <p><i>Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.</i></p>
2. Workshop Calculation & Science	<p>Degree in Engineering with one year experience. OR Diploma in Engineering with two years experience.</p> <p>Desirable: Craft Instructor Certificate in RoD & A course under NCVT.</p>
3. Engineering Drawing	<p>Degree in Engineering with one year experience. OR Diploma in Engineering with two years experience. OR NTC / NAC passed in the Draughtsman (Mechanical / Civil) with three</p>

	years experience. Desirable: Craft Instructor Certificate in RoD & A course under NCVT.					
4. Employability Skill	MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGT institutes. AND Must have studied English/ Communication Skills and Basic Computer at 12 th / Diploma level and above. OR Existing Social Studies Instructors duly trained in Employability Skills from DGT institutes.					
List of Tools and Equipment	As per Annexure – I					
Distribution of training on Hourly basis: (Indicative only)						
Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra-curricular activity
40 Hours	25 Hours	6 Hours	2 Hours	3 Hours	2 Hours	2 Hours

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5. NSQF LEVEL COMPLIANCE

NSQF level for **Textile Mechatronics** trade under CTS: **Level 5**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

- a. Process
- b. Professional Knowledge
- c. Professional Skill
- d. Core Skill
- e. Responsibility

The broad Learning outcome of **Textile Mechatronics** trade under CTS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context.	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and learning and some responsibility for other's work and learning.

6. LEARNING/ ASSESSABLE OUTCOME

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

6.1 GENERIC LEARNING OUTCOME

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Understand and explain different mathematical calculation & science in the field of study including basic electrical. [*Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature etc.*]
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. [*Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol*]
4. Select and ascertain measuring instrument and measure dimension of components and record data.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
8. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Semester – I

9. Select and perform electrical / electronic measurement of single range meter & perform panel wiring using cable, connectors, protective devices and test functionality.
10. Test & service different cells and construct different electrical sub system and measure parameters and install various control wiring system.
11. Construct, verify characteristics of electrical and magnetic circuits and measure power and energy with load.
12. Execute testing, identify terminal and maintenance of alternator, AC Motors, Transformer and Starters.

13. Plan and prepare earthing insulation.
14. Plan and execute electrical illumination system and detect faults in rectifier and service of different domestic and industrial appliances.
15. Plan and execute soldering and desoldering of various electronic and industrial appliances.
16. Construct test and verify the input/output characteristics of various analog and power electronic circuits and analyze the circuit functioning.
17. Construct a programme and verify different digital logic circuits and timer circuits using 555 IC's, simple programme on microprocessor and PLC.

Semester – II

18. Perform basic workshop operation of different manufacturing sections, methods and identify different components.
19. Check different electrical wiring & winding methods of different electrical sub system.
20. Identify different Hydraulic & pneumatic applications in textile machines.
21. Identify different motors, sensors and transducers applications in textile.

Semester – III

22. Identify different components of yarn preparatory machine for its maintenance.
23. Check different components of knitting & weaving machine for its maintenance.
24. Identify different components of Handloom & Power loom Turning for its maintenance.
25. Check different Pneumatic Automation & control In Textile Machines.
26. Simulate electro-pneumatic systems involving pneumatic controls.
27. Apply Advanced Automation System in Textile industries.

Semester – IV

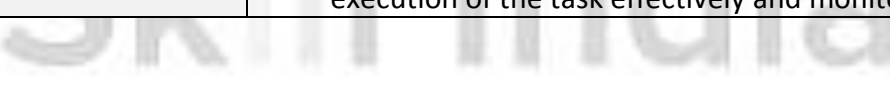
28. Identify different HMI panels in textile industries & their applications.
29. Check different flat /circular knitting machine for maintenance.
30. Check different production methods, machine maintenance & quality control concepts in Industry.

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING/ ASSESSABLE OUTCOME	
LEARNING/ ASSESSABLE OUTCOME	ASSESSMENT CRITERIA
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	1.2 Recognize and report all unsafe situations according to site policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1.4 Identify, handle and store / dispose off dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	1.5 Identify and observe site policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1.8 Identify and observe site evacuation procedures according to site policy.
	1.9 Identify Personal Protective Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.
	1.11 Identify different fire extinguisher and use the same as per requirement.
	1.12 Identify environmental pollution & contribute to avoidance of same.
	1.13 Take opportunities to use energy and materials in an environmentally friendly manner
	1.14 Avoid waste and dispose waste as per procedure
	1.15 Recognize different components of 5S and apply the same in the working environment.
2. Understand, explain different mathematical calculation & science in the field of study	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat

including basic electrical and apply in day to day work. <i>[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature etc.]</i>	treatment, centre of gravity, friction.
	2.2 Measure dimensions as per drawing
	2.3 Use scale/ tapes to measure for fitting to specification.
	2.4 Comply given tolerance.
	2.5 Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
	2.6 Ensure dimensional accuracy of assembly by using different instruments/gauges.
	2.7 Explain basic electricity, insulation & earthing.
India	
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. <i>[Different engineering drawing- Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]</i>	3.1 Read & interpret the information on drawings and apply in executing practical work.
	3.2 Read & analyse the specification to ascertain the material requirement, tools, and machining /assembly /maintenance parameters.
	3.3 Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as micrometers, vernier callipers, dial gauge, bevel protector and height gauge (as per tool list).
	4.2 Ascertain the functionality & correctness of the instrument.
	4.3 Measure dimension of the components & record data to analyse the with given drawing/measurement.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	5.1 Explain the concept of productivity and quality tools and apply during execution of job.
	5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws.
	5.3 Knows benefits guaranteed under various acts

<p>6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.</p>	<p>6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available resources optimally & remain sensitive to avoid environment pollution.</p>
	<p>6.2 Dispose waste following standard procedure.</p>
<p>7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.</p>	<p>7.1 Explain personnel finance and entrepreneurship.</p>
	<p>7.2 Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.</p>
	<p>7.3 Prepare Project report to become an entrepreneur for submission to financial institutions.</p>
<p>8. Plan and organize the work related to the occupation.</p>	<p>8.1 Use documents, drawings and recognize hazards in the work site.</p>
	<p>8.2 Plan workplace/ assembly location with due consideration to operational stipulation</p>
	<p>8.3 Communicate effectively with others and plan project tasks</p>
	<p>8.4 Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.</p>


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SPECIFIC LEARNING / ASSESSABLE OUTCOME	
LEARNING/ ASSESSABLE OUTCOME	ASSESSMENT CRITERIA
SEMESTER-I	
9. Select and perform electrical / electronic measurement of single range meter & perform panel wiring using cable, connectors, protective devices and test functionality.	9.1 Connect vm, am in a simple low voltage dc circuit.
	9.2 Measure the current & voltage.
	9.3 Perform skinning the cables and different joint practice-in single & multi strand cables.
	9.4 Verify the characteristics of series and parallel circuit
	9.5 Measure power and energy.
10. Test & service different cells and construct different electrical sub system and measure parameters and install various control wiring system.	10.1 Check current charging of secondary cells.
	10.2 Trace magnetic field, prepare solenoid and vary its strength.
	10.3 Identify terminal connections, Build up the voltage.
	10.4 Start, run & maintain different motors.
	10.5 Wire up one lamp and one socket independently to prepare a test board.
11. Construct, verify characteristics of electrical and magnetic circuits and measure power and energy with load.	11.1 Measure the current, voltage, P.F. Frequency, power of a simple A.C circuits.
	11.2 Verify the characteristics of RLC series and parallel circuit.
	11.3 Verify characteristics of star delta connections.
	11.4 Measure the power and energy of three phase load.
12. Execute testing, identify terminal and maintenance of alternator, AC Motors, Transformer and Starters.	12.1 Identify the terminals of Alternator & build up the voltage.
	12.2 Start, run and reverse different types of single phase motor.
	12.3 Start, Run and reverse different types of three phase motor with different types of starters.
	12.4 Identify the terminals of transformer.
	12.5 Measure the primary & secondary voltage and respective currents.
13. Plan and prepare earthing insulation.	13.1 Identify lead terminals of megger.
	13.2 Measure the resistance of cable.
	13.3 Check short circuit with megger.
	13.4 Measure the insulation value with megger.
14. Plan and execute electrical illumination system and detect faults in rectifier and service of	14.1 Connect and test F.T, M.V / S.V lamps & energy efficient lamps.
	14.2 Apply Norms for illumination in textile mills

different domestic and industrial appliances.	14.3 Carry out fault finding, rectification and servicing of different types of domestic and Industrial appliances
15. Plan and execute soldering and desoldering of various electronic and industrial appliances.	15.1 Perform Soldering & De-soldering.
	15.2 Identifying simple meters & the multimeter.
	15.3 Verify Ohm's law
	15.4 Identify and test the given components.
	15.5 Identify the color code of Resistors.
	15.6 Identify VI characteristics of diode Half wave & Full wave rectifier.
16. Construct test and verify the input/output characteristics of various analog and power electronic circuits and analyze the circuit functioning.	16.1 Check Voltage regulator circuit-Input-Output characteristic of Transistors at common base- common collector- common emitter modes.
	16.2 Construct Transistors & Amplifiers.
	16.3 Identify VI characteristics of SCR-speed control of D.C motor using SCR.
	16.4 Check FET amplifier Ckts.
	16.5 Identify UJT relaxation oscillator.
17. Construct a programme and verify different digital logic circuits and timer circuits using 555 IC's, simple programme on microprocessor and PLC.	17.1 Identify different logic gates.
	17.2 Test gates using Ics & Construct Timer circuits using 555 Ics.
	17.3 Perform simple programming through microprocessor kit
	17.4 Identify commonly used Transducers.
	17.5 Demonstrate various controlling units.
	17.6 Compare PLC with conventional machine control.
	17.7 Identify different functions of keys on programme-Development Terminal (PDT).
SEMESTER-II	
18. Perform basic workshop operation of different manufacturing sections, methods and identify different components.	18.1 Identify mechanical, electrical & electronics components of the machine, setting & maintenance.
	18.2 rotating machinery division, electric motor assembly section
	18.3 Identify basic workshop operation of rotating machinery division, electric motor assembly section, heavy engineering division, machine shop and tool room section.
	18.4 Identify various methods for transporting materials and machines of various sizes.
19. Check different electrical wiring & winding methods of different electrical sub system.	19.1 Check wiring methods and perform an experiment to control one lam by one single way switch and 3 pin wall socket with switch control.

	19.2	Check advanced wiring of a switch control board and panel
	19.3	Identify the winding and test an AC relay coil.
	19.4	Test a single phase transformer.
	19.5	Connect the end connections of a 3- phase induction motor.
20. Identify different Hydraulic & pneumatic applications in textile machines.	20.1	Identify different feedback elements and control elements
	20.2	Determine settings, speeds, production, efficiency and machinery particulars for carding.
21. Identify different motors, sensors and transducers applications in textile.	21.1	Determine settings, speeds, production, efficiency and machinery particulars for draw frame.
	21.2	Determine settings, speeds, production, efficiency and machinery particulars for speed frame.
	21.3	Determine settings, speeds, production, efficiency and machinery particulars for spinning & winding.
SEMESTER-III		
22. Identify different components of yarn preparatory machine for its maintenance.	22.1	Determine settings, speeds, production, efficiency and machinery particulars for yarn preparatory machine.
	22.2	Identify mechanical, electrical & electronics components of the machine, setting & maintenance.
23. Check different components of knitting & weaving machine for its maintenance.	23.1	Determine settings, speeds, production, efficiency and machinery particulars for knitting & weaving machine.
	23.2	Identification of mechanical, electrical & electronics components of the machine, setting & maintenance.
24. Identify different components of Handloom & Power loom Turning for its maintenance.	24.1	Identify Handloom & Power loom Turning setting, production & running.
	24.2	Check mechanical, electrical & electronics components of the machine, setting & maintenance.
25. Check different Pneumatic Automation & control In Textile Machines.	25.1	Identify different constructional features of pneumatic components using cut-section models and demonstration KIT.
	25.2	Simulate circuits using Festo trainer kit.
	25.3	Simulate multiple actuator systems.
26. Simulate electro-pneumatic systems involving pneumatic controls.	26.1	Simulate electro-pneumatic systems.
	26.2	Simulate electro-pneumatic systems employing proximity switches, optical sensors and capacitive sensors.
	26.3	Identify Simple circuits using hydraulic elements.

27. Apply Advanced Automation System in Textile industries.	27.1 Identify different PLC blocks.
	27.2 Carry out simple experiment on PLC.
	27.3 Check PLC based electronic controls.
SEMESTER-IV	
28. Identify different HMI panels in textile industries & their applications.	28.1 Identify role of HMI panels in textile industries.
	28.2 Perform calculation, setting of modern spinning & weaving machines.
	28.3 Identify mechanical, electrical & electronics components of the machine, setting & maintenance.
29. Check different flat /circular knitting machine for maintenance.	29.1 Calculate speed production and identify different mechanisms of flat / circular machines.
	29.2 Identify mechanical, electrical & electronics components of the machine, setting & maintenance.
30. Check different production methods, machine maintenance & quality control concepts in Industry.	30.1 Check Industrial safety & Health hazard.
	30.2 Check different Industrial production, machine maintenance & Quality concept viz. ISO9001-2000, SA8000, ISO14001-2004, 5S system, OHSAS18001-1999.

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SYLLABUS FOR TEXTILE MECHATRONICS TRADE			
FIRST SEMESTER- 6 Months			
Week No.	Reference Learning Outcome	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	Apply safe working practices.	1. Demonstration about artificial respiration and common defects practices for workshop.	Industrial safety precautions- safety devices, safety signs. First aid- fire extinguishers
2-4	Select and perform electrical / electronic measurement of single range meter & perform panel wiring using cable, connectors, protective devices and test functionality.	2. Connect vm, am in a simple low voltage dc circuit. 3. Measure the current & voltage. 4. Skinning the cables and different joint practice-in single & multi strand cables. 5. Verify the characteristics of series and parallel circuit. 6. Measure power and energy.	Fundamentals of electrical terms and definitions with their units-symbols -effects of electricity, conductor-insulator-semi conductor-type of cables. Work power and energy (p.e and k.e) ohm's law series and parallel circuit with simple problems.
5-9	Test & service different cells and construct different electrical sub system and measure parameters and install various control wiring system.	7. Grouping of cells for required voltage. 8. Current charging of secondary cells. 9. Tracing of magnetic field preparation of solenoid and vary its strength. 10. Identification of terminal connections, Build up the voltage. 11. Starting, running & maintenance of different motors. 12. One lamp controlled by one way / two way switch, to wire up for one lamp and one socket independently,	Primary cells-types of cells defects-applications secondary cells. Types of cells types of charging, care and maintenance. Applications-Electromagnetic induction Faraday's Law-Lenz's Law. D.C generator- Construction-Working principle-Types of generator and applications. Different types of motors, AC/ D.C motor-Construction-Working principle-Types application necessity of starter-Types. Different types of Pump motors. Wiring-Types of wiring- Application of different types of

		to prepare a test board.	wiring-Wiring accessories- Materials-Ear thing.
10-11	Construct, verify characteristics of electrical and magnetic circuits and measure power and energy with load.	13. Measure the current voltage P.F. Frequency, power of a simple A.C circuits. 14. Verify the characteristics of RLC series and parallel circuit. 15. Verify characteristics of star delta connections. 16. Measure the power and energy of three phase load.	Fundamental terms in A.C circuits -types of A.C circuits-P. F-advantages of good P.F disadvantages of poor P.F-improvement of P.F Poly phase star and delta connections-line voltage-phase voltage-line current-phase current.
12-15	Execute testing, identify terminal and maintenance of alternator, AC Motors, Transformer and Starters.	17. Identify the terminals of Alternator & buildup the voltage. 18. Start, run and reverse different types of single phase motor. 19. Start, Run and reverse different types of three phase motor with different types of starters. 20. Identify the terminals of transformer. 21. Measure the primary & secondary voltage and respective currents.	Alternators-Construction-working principle -voltage regulations-phase sequence A.C motor-Single phase motor working principle-types. Three phase motor working principle -types starter and their types. Transformer-principle-types & their application.
16	Plan and prepare earthing insulation.	22. DEMO: The type of meters-measure the insulation value with megger.	Instruments-V.M, A.M, W.M, E.M-types-connections. Megger and application
17-18	Plan and execute electrical illumination system and detect faults in rectifier and service of different domestic and industrial appliances.	23. Connect and test F.T, M.V / S.V lamps & energy efficient lamps. 24. Application of Norms for illumination in textile mills. 25. Fault finding, rectification and servicing of different types of domestic and Industrial appliances.	Illumination -incandescent lamp-fluorescent lamp-M. V lamp-connections-applications care and maintenance. Working and maintenance of domestic and Industrial appliances- heaters/ Furnaces/ Pump set.
19-20	Plan and execute soldering and desoldering of various electronic and industrial appliances.	ELECTRONICS: 26. Soldering & De-soldering practice Identifying simple meters-Study the multimeter.	Conductor, insulator,, Semiconductor, types of solder, Types of fluxes methods of soldering Resistors, Capacitors, inductors etc. Types specification

		<p>27. Verify Ohm's law.</p> <p>28. Identification and testing the given components.</p> <p>29. Identify the color code of Resistors.</p> <p>30. Identify VI characteristics of diode Half wave & Full wave rectifier.</p>	<p>and their applications. Study of solid state device such as diodes, transistors SCR and Ics. Semiconductor theory P-type and N-Type Semiconductors. Diode-Constructions working rectifiers, filters.</p>
21	<p>Construct test and verify the input/output characteristics of various analog and power electronic circuits and analyze the circuit functioning.</p>	<p>31. Voltage regulator circuit-Input-Output characteristic of Transistors at common base- common collector-common emitter modes.</p> <p>32. Study of Integrated (IC) circuit.</p> <p>33. Construction of Transistors & Amplifiers.</p> <p>34. VI characteristics of SCR-speed control of D.C motor using SCR.</p> <p>35. Checking of FET amplifier Ckts.</p> <p>36. Identification of UJT relaxation oscillator.</p>	<p>Transistors-construction working amplifier circuits SCR, FET, UJT, DIAC & TRAIC constructions working applications circuits. Study of Integrated (IC)</p>
22	<p>Construct a programme and verify different digital logic circuits and timer circuits using 555 IC's, simple programme on microprocessor and PLC.</p>	<p>37. Study of different logic gates.</p> <p>38. Testing of gates using ICs-Constructions of Timer circuits using 555 ICs.</p> <p>39. Simple programming through microprocessor kit.</p> <p>40. Study of commonly used Transducers.</p> <p>41. Demonstration of various controlling units.</p> <p>42. Comparisons of PLC with conventional machine control.</p> <p>43. Functions of keys on programme- Development Terminal (PDT).</p>	<p>Introduction to logic gates. Explanation of basic logic gates, OR, AND, NOT, NOR AND , EX - OR etc. Truth table using diodes, transistors, resistors. Logic gates using etc. Flip-Flops-Counters, Timer circuits.</p> <p>Microprocessor -working principle & block diagram. Transducers- thermocouples, thermostats, LDRs, LVDTs, strain gauges, magnetic pickup photo diodes, photo transistor. Over current relays, D.C Motor controllers photo electrical relays.</p> <p>Concept of PLC Block diagram comparison of PLC with conventional terminal / relay. Function of various programmes development terminal (PDT)</p>



23-24	Project work/ Industrial Visit
25	Revision
26	Examination



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SECOND SEMESTER – 06 Months

Week No.	Reference Learning outcome	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
27-30	Perform basic workshop operation of different manufacturing sections, methods and identify different components.	44. Elementary training in Basic Manufacturing Methods (welding & press shop), 45. Identification of mechanical, electrical & electronics components of the machine, setting & maintenance. 46. Elementary training in rotating machinery division, electric motor assembly section. 47. Elementary training in heavy engineering division, machine shop and tool room section. 48. Elementary training in assembly section. 49. Study of various methods for transporting materials and machines of various sizes.	Introduction - Objectives of blow room- identification of components of the machine, & and its functions Objectives of carding- Working mechanism of carding- Identification and importance of components in carding. Objectives and working of lap formers & Comber- identification of machine components and its functions. Objectives and working Draw frame-identification of machine components and its functions. Objectives and working Speed frame-Simplex- spinning-working Mechanism. Auto cone Winding- Sequence of Process- Mechanism of Cone/cheese -winding-Working principle and operation.
31-35	Check different electrical wiring & winding methods of different electrical sub system.	50. Study of wiring methods and perform an experiment to control one lam by one single way switch and 3 pin wall socket with switch control. 51. Advanced wiring of a switch control board and panel. 52. Demonstration of the winding and testing of an AC relay coil. 53. Demonstration the winding and testing of a single phase transformer. 54. Experiment to connect the end connections of a 3-	Application of Mechatronics in Blow room & Carding. Electrical and electronics involved in Blow room - regulation of cotton flow- detection of foreign particles Coiler-stop motion units- Electric motors-working- principle of operation-introduction to electric drives-drives involved in textile machines and their importance Can changer mechanism, principle of auto leveler, importance and its functions, control systems involved in Auto leveler, production & monitoring system APPLICATION OF MECHATRONICS

		phase induction motor.	IN COMBER, DRAW FRAME, LAP FROMERS AND SPEED FRAME: Working principle of Comber-starting mechanism-Electronics involved in Doffing operation-Draw frames Working principle of Speed frames-controls system in speed frame machines-Cone drum mechanism
36-41	Identify different Hydraulic & pneumatic applications in textile machines.	55. Study of feedback elements and control elements. 56. Determination of settings, speeds, production, efficiency and machinery particulars for carding.	Introductions to Hydraulics-application of hydraulics Hydraulics-application. Fluid couplings-Drive tech- Waste Evacuation system. Spinning-working principle of pneumatic speed variator-doffing sequence-electronics in doffing sequence.
42-48	Identify different motors, sensors and transducers applications in textile.	57. Determination of settings, speeds, production, efficiency and machinery particulars for draw frame. 58. Determination of settings, speeds, production, efficiency and machinery particulars for speed frame. 59. Determination of settings, speeds, production, efficiency and machinery particulars for spinning & winding.	Importance of over head cleaners and their operation-drives, motors sensors and transducers operations in over head cleaners Importance of OE Spinning-electronic controls- drives, motors and mechanism in OE Spinning Principle of Winding-electronic controls in Auto corner - Principle of conveyor operation
49-50	Project work / Industrial visit		
51	Revision		
52	Examination		

SYLLABUS FOR TEXTILE MECHATRONICS TRADE			
THIRD SEMESTER - 06 Months			
Week No.	Reference Learning outcome	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
53-54	Identify different components of yarn preparatory machine for its maintenance.	60. Determination of settings, speeds, production, efficiency and machinery particulars for yarn preparatory machine. 61. Identification of mechanical, electrical & electronics components of the machine, setting & maintenance.	Principles of yarn preparatory m/c.
55-56	Check different components of knitting & weaving machine for its maintenance.	62. Determination of settings, speeds, production, efficiency and machinery particulars for knitting & weaving machine. 63. Identification of mechanical, electrical & electronics components of the machine, setting & maintenance.	Principles of knitting & weaving machine
57-58	Identify different components of Handloom & Power loom Turning for its maintenance.	64. Handloom & Power loom Turning & setting & production & running. 65. Identification of mechanical, electrical & electronics components of the machine, setting & maintenance.	Working principles of different types of looms.
59-63	Check different Pneumatic Automation & control In Textile Machines.	66. Study of constructional features of pneumatic components, using cut-section models and demonstration KIT. 67. Simulation of circuits using Festo trainer kit. 68. Simulation of multiple actuator systems.	PNEUMATIC AUTOMATION IN TEXTILE MACHINES: Introduction to pneumatics- application of pneumatics in blow room Pneumatic controls in carding machine-components involved and their control systems Pneumatic controls comber M/C components and its

			functions and identification of basic components
64-70	Simulate electro-pneumatic systems involving pneumatic controls.	69. Simulation of electro-pneumatic systems. 70. Simulation of electro-pneumatic systems employing proximity switches, optical sensors and capacitive sensors. 71. Simple circuits using hydraulic elements.	Pneumatic controls silver lap and ribbon lap former-components involved and their control systems. Pneumatic controls drawing machines and ring frames components involved and their basic operations Pneumatic controls winding machines-components involved and their control systems
71-74	Apply Advanced Automation System in Textile industries.	72. Identification of PLC blocks. 73. Simple experiment on PLC. 74. PLC based electronic controls.	INTRODUCTION TO ADVANCED AUTOMATION SYSTEM: Introduction to PLC and their programming methods-block diagram of PLC-working of PLC-Input and output units. Role of PLCs in textile industries-programming examples-logic gates
75-76	Project work/ Industrial visit		
77	Revision		
78	Examination		

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SYLLABUS FOR TEXTILE MECHATRONICS TRADE			
FOURTH SEMESTER – 06 Months			
Week No.	Reference Learning outcome	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
79-86	Identify different HMI panels in textile industries & their applications.	75. Introduction to HMI (Human m/c Interface) Software. 76. Calculation, setting of modern spinning & weaving machines. 77. Identification of mechanical, electrical & electronics components of the machine, setting & maintenance.	Role of HMI panels in textile industries-hand held operating system Introduction to working of modern spinning & weaving machine
87-92	Check different flat /circular knitting machine for maintenance.	78. Calculation of speed. Production and study of different mechanisms of flat / circular machines. 79. Identification of mechanical, electrical & electronics components of the machine, setting & maintenance.	Working of flat /circular knitting machine- control, Operations and their importance
93-100	Check different production methods, machine maintenance & quality control concepts in Industry.	80. Industrial safety & Health hazard. 81. Industrial Visit & Implant training in production & machine maintenance.	Quality concept, ISO9001-2000, SA8000, ISO14001-2004, 5S system, OHSAS18001-1999 Industrial Visit
101-102	Project work		
103	Revision		
104	Examination		

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

SL. No.	Workshop Calculation and Science	Engineering Drawing
First Semester		
1.	Unit: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	Engineering Drawing: Introduction and its importance - Relationship to other technical drawing types - Conventions - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003
2.	Fractions : Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator	Drawing Instruments : their Standard and uses - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
3.	Square Root : Square and Square Root, method of finding out square roots, Simple problem using calculator	Lines : - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment
4.	Ratio & Proportion : Simple calculation on related problems.	Drawing of Geometrical Figures: Definition, nomenclature and practice of - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
5.	Percentage: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	Lettering and Numbering as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.
6.	Material Science : properties - Physical & Mechanical, Types – Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous	Dimensioning: - Definition, types and methods of dimensioning (functional, nonfunctional and auxiliary) - Types of arrowhead - Leader Line with text

	metals, NonFerrous Alloys.	
7.	Mass ,Weight and Density : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.	Free hand drawing of - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension - Transferring measurement from the given object to the free hand sketches.
8.	Speed and Velocity: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.	Sizes and Layout of Drawing Sheets - Basic principle of Sheet Size - Designation of sizes - Selection of sizes - Title Block, its position and content - Borders and Frames (Orientation marks and graduations) - Grid Reference - Item Reference on Drawing Sheet (Item List)
9.	Work, Power and Energy: work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.	Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view
10.	-----	Symbolic Representation (as per BIS SP:46-2003) of : - Fastener (Rivets, Bolts and Nuts) 3 hrs. 7 - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings
Second Semester		
1.	Algebra : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	Construction of Scales and diagonal scale
2.	Mensuration : Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids – cube, cuboid, cylinder and Sphere.	Practice of Lettering and Title Block
3.	Trigonometry: Trigonometrical ratios, measurement of angles. Trigonometric tables	Dimensioning practice: - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance. - Text of dimension of repeated features, equidistance elements,

		circumferential objects.
4.	Heat & Temperature: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.	Construction of Geometrical Drawing Figures: - Different Polygons and their values of included angles. Inscribed and Circumscribed polygons. - Conic Sections (Ellipse & Parabola)
5.	Basic Electricity: Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections – series, parallel, electric power, Horse power, energy, unit of electrical energy.	Drawing of Solid figures (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions.
6.	Levers and Simple Machines: levers and its types. Simple Machines, Effort and Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage.	Free Hand sketch of hand tools and measuring tools used in respective trades.
7.	-----	Projections: - Concept of axes plane and quadrant. - Orthographic projections - Method of first angle and third angle projections (definition and difference) - Symbol of 1st angle and 3rd angle projection as per IS specification.
8.	-----	Drawing of Orthographic projection from isometric/3D view of blocks
9.	-----	Orthographic Drawing of simple fastener (Rivet, Bolts, Nuts & Screw)
10.	-----	Drawing details of two simple mating blocks and assembled view.

Third Semester

1.	Calculation on volume & weights of solid & hollow bodies. C.G.S. & S.I. system of units of force, weight etc.	Machined components; concept of fillet & chamfer; surface finish symbols.
2.	Pressure:- Pneumatic pressure, PSI, bar, atmospheric pressure, pressure gauge and absolute pressure, Heat treatment process.	Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
3.	Units of volume. Calculation on volume, unit conversions. Calculations on relation between volume, mass and density	Free hand Sketches for bolts, nuts, screws and other screwed members.
4.	Elasticity: Stress, strain, Modulus of elasticity, elastic limit, Hooks law, young's modulus.	Free hand Sketching of foundation bolts and types of washers.
5.	Material Science: Introduction, types and properties. Uses of Conducting, Semiconducting and insulating materials.	Standard rivet forms as per BIS (Six types).
6.	Magnetism: Magnetic material, magnetic field, flux density, magnetic moment, m.m.f. Reluctance, permeability, susceptibility, electromagnet, solenoid and its practical applications.	Riveted joints-Butt & Lap (Drawing one for each type).
7.	-----	Orthogonal views of keys of different types
8.	-----	Free hand Sketches for simple pipe, unions with simple pipe line drawings.
9.	-----	Concept of preparation of assembly drawing and detailing. Preparation of simple assemblies & their details of trade related tools/job/exercises with the dimensions from the given sample or models.
10.	-----	Free hand sketch of trade related components / parts (viz., single tool post for the lathe, etc.)
11.	-----	Study of assembled views of Vee-blocks with clamps.
12.	-----	Study of assembled views of shaft and pulley.
Fourth Semester		
1.	Indices: Laws of indices & related problems. Quadratic Equation: Introduction, solution of simple Quadratic	Free hand Details and assembly of simple bench vice.

	equation and related problems.	
2.	Simple problems on profit and loss. Simple and compound interest.	Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries
3.	Corrosion: What is corrosion. Difference between corrosion and rancidity. Precaution to avoid corrosion.	Simple exercises relating missing symbols. Missing views
4.	Defining work, power energy, torque. Laws of conservation of energy, Forms of energy, kinetic energy & potential energy	Simple exercises related to missing section.
5.	Friction: Law of friction, co-efficient of friction, angle of friction, advantage and disadvantage of friction.	Free hand sketching of different types of bearings and its conventional representation.
6.	Force: Resolution and Composition of forces. Representation of forces by vectors, simple problems on lifting tackles like Jib wall, crane solution of problems with the aid of vectors, General condition of equilibrium for series of forces on a body.	Free hand sketching of different gear wheels and nomenclature.
7.	Gravity: Centre of Gravity, example on stable, unstable and neutral equilibrium.	Simple exercises related to trade related symbols.
8.	Estimation & Costing:- Simple estimation of the requirement of materials etc. as applicable to the trade. Problems on estimation and costing. Calculating on the cost of repairing/reconditioning of machine as applicable to the trade	Study of drawing & Estimation of materials.
9.	-----	Basic electrical and electronic symbols

9.2 EMPLOYABILITY SKILLS

CORE SKILL – EMPLOYABILITY SKILL	
First Semester	
1. English Literacy	Duration : 20 hrs Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking/ Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on known people, picture reading, gain confidence through role- playing and discussions on current happening, job description, asking about someone's job, habitual actions. Cardinal (fundamental) numbers, ordinal numbers. Taking messages, passing on messages and filling in message forms, Greeting and introductions, office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. IT Literacy	Duration : 20 hrs Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of the computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc. Use of Common applications.
Word Processing and Worksheet	Basic operating of Word Processing, Creating, Opening and Closing Documents, Use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & Creation of Tables. Printing document. Basics of Excel worksheet, understanding basic

	commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking and Internet	Basic of Computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, WebSite, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills	
	Duration : 15 hrs Marks : 07
Introduction to Communication Skills	Communication and its importance Principles of effective communication Types of communication - verbal, non-verbal, written, email, talking on phone. Non-verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening, guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active listening skills.
Motivational Training	Characteristics essential to achieving success. The power of positive attitude. Self awareness Importance of commitment Ethics and values Ways to motivate oneself Personal goal setting and employability planning.
Facing Interviews	Manners, etiquettes, dress code for an interview Do's & don'ts for an interview

Behavioral Skills	Problem solving Confidence building Attitude
Second Semester	
4. Entrepreneurship Skills	Duration : 15 hrs Marks : 06
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises: Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & record, Role & function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing Analysis	Qualities of a good entrepreneur, SWOT and risk analysis. Concept & Application of PLC, Sales & Distribution management. Difference between small scale & large scale business, Market survey, Method of marketing, Publicity and advertisement, Marketing mix.
Institution's Support	Preparation of project. Role of various schemes and institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non-financing support agencies to familiarize with the policies / programmes, procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop act, Estimation & costing, Investment procedure - Loan procurement - Banking processes.
5. Productivity	Duration : 10 hrs Marks : 05
Benefits	Personal/ Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working aids, Automation, Environment, Motivation - How it improves or slows down productivity.
Comparison with Developed Countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in select industries, e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and insurance.
6. Occupational Safety, Health and Environment Education	Duration : 15 hrs Marks : 06

Safety & Health	Introduction to occupational safety and health Importance of safety and health at workplace.
Occupational Hazards	Basic hazards, chemical hazards, vibro acoustic hazards, mechanical hazards, electrical hazards, thermal hazards. Occupational health, occupational hygiene, occupational diseases/ disorders & its prevention.
Accident & Safety	Basic principles for protective equipment. Accident prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & sick at the workplaces, First-aid & transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. Safety, health, welfare under legislative of India.
Ecosystem	Introduction to environment. The relationship between society and environment, ecosystem and factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of energy, re-use and recycle.
Global Warming	Global warming, climate change and ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and harvesting of water.
Environment	Right attitude towards environment, Maintenance of in-house environment.
7. Labour Welfare Legislation	
Duration : 05 hrs Marks : 03	
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's Compensation Act.
8. Quality Tools	
Duration : 10 hrs Marks : 05	
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality

	circle, Roles and function of quality circles in organization, Operation of quality circle. Approaches to starting quality circles, Steps for continuation quality circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of housekeeping, Practice of good housekeeping.
Quality Tools	Basic quality tools with a few examples.



Skill India

 कौशल भारत - कुशल भारत

List of Tools and Equipment			
TEXTILE MECHATRONICS (For Batch of 20 candidates)			
S No.	Name of the Tools and Equipment	Specification	Quantity
A. TRAINEES TOOL KIT (For each additional unit trainees tool kit sl. 1-25 is required additionally)			
1.	Combination Pliers	200 mm insulated	21 Nos.
2.	Screw Driver	200 mm	21 Nos.
3.	Screw Driver	100 mm	21 Nos.
4.	Terminal Screw Driver		21 Nos.
5.	Hammer Ball Pein	0.25 kg	21 Nos.
6.	Try Square	200 mm	21 Nos.
7.	File round (half)	2" cut 250 mm	21 Nos.
8.	File round	150 mm	21 Nos.
9.	Plumb Both	115 gm.	21 Nos.
10.	Barwood Mallet	1 Kg. (75 mm X150 mm)	21 Nos.
11.	Knife		21 Nos.
12.	Wood rasp file	250 mm	21 Nos.
13.	Firmer chisel	12 mm	21 Nos.
14.	Firmer chisel	6 mm	21 Nos.
15.	Neon Tester		21 Nos.
16.	Tenon saw	250 mm	21 Nos.
17.	File flat	25 cm. 2 nd cut	21 Nos.
18.	File flat	25 cm. Smooth	21 Nos.
19.	Steel Rule	300 mm to read Metric	21 Nos.
20.	Test lamp		21 Nos.
21.	Circlip Opener		21 Nos.
22.	Continuity Tester		21 Nos.
23.	Glouse		21 Nos.
24.	Insulating Tape		21 Nos.
25.	Electrical soldering Iron		21 Nos.
B. SHOP TOOLS, INSTRUMENTS – For 2 (1+1) units no additional items are required			
Lists of Tools:			
26.	Ammeter	1 MA to 500 MA	1 No.
27.	Ammeter	0 to lamp D.C	1 No.
28.	DC ammeter	(0-5) A	4 Nos.
29.	Ammeter	(0-50) mA	3 Nos.
30.	AC ammeter	(0-10)A	4 Nos.
31.	DC voltmeter	(0-250)V	4 Nos.



32.	Mill voltmeter	100-0-100 m Volt	1 No.
33.	Digital voltmeter		3 Nos.
34.	AC Voltmeter	(0-300) V	2 Nos.
35.	AC voltmeter	(0-600) V	1 No.
36.	AC Voltmeter	M.I. 0-500V	1 No.
37.	KW meter	0 to 1 K.W. capacity 1:2	1 No.
38.	Single phase power factor meter		1 No.
39.	Frequency meter		1 No.
40.	AC Energy meter	single phase 5A 230V	1 No.
41.	Megger	500 volts	1 No.
42.	Fan	DC 220 Volt 1200 mm	1 No.
43.	Electric hot plate	150 Watt. 220V with temperature control	1 No.
44.	Electric kettle	1000 watts. 230 V	1 No.
45.	Immersion heater	750/1000/1500W-230V	1 No.
46.	Series type ohm meter	0-2000 approximate	1 No.
47.	Shunt type ohm meter	0-25 approximate	1 No.
48.	3-point DC starter ¹		1 No.
49.	4-point DC starters		1 No.
50.	Cut out, reverse current over load voltage relays		1 No.
51.	Starters	3-phase, 400V, 50 cycles, 2 to 5 H.P. AC motors	1 No.
52.	Auto transformer type starter		1 No.
53.	Star delta starter with manual, semi auto & Automatic		1 No.
54.	Direct on line starter		1 No.
55.	Multimeter		
56.	Motor generator set consisting of:	Motor shunt 5HP, 440 Volts with starting Compensator and switch directly coupled to generator A.C 3.5 KVA, 400/230 Volts, 3-phase, 4 wire, 0.3 PF 50 cycles with exciter and 1 switch Board mounted with regulator circuit breaker, ammeter, voltmeter frequency meter, knife blade switch and fuses etc., set complete with cast iron bed plate, fixing blots, foundation bolts & flexible coupling	1 No.

57.	Motor shunt DC,	220 volt, 2 to 3 H.P.	1 No.
58.	Motor AC Single phase,	230 volt, 1 H.P. repulsion type with starter and switch	1 No.
59.	Motor AC Single	phase 230 volt, 50 cycles series type with starter/switch H.P.	1 No.
60.	Current transformer		1 No.
61.	Potential transformer		1 No.
62.	Variable auto transformer	0-250 V 5 apms	1 No.
63.	Single phase resistive load	3 KW	1 No.
64.	Three phase resistive load	10 KW	1 No.
65.	Motor generator set consisting of:	Motor Induction squirrel cage, 7 HP 400 volts, 50 cycle 3-phase with star delta starter and switch directly coupled to DC shunt generator, 5 KW 400 volts, switch board mounted with regulator, air circuit breaker, ammeter, voltmeter knife blade switches and fuses, set complete with cast iron and plate, fixing bolts. Foundation bolts and Flexible coupling.	1 Complete set
66.	Motor of AC squirrel cage,	3-phase 400 volt, 50 cycles, 2 to 3 HP with star delta starter.	1 No.
67.	Motor AC phase-wound slip ring type	5 HP 400 volts, 3-phase, 50 cycles with starter and switch	1 No.
68.	Soldering Iron set with temp control		1 No.
69.	Soldering Iron		1 No.
70.	De-soldering pump		1 No.
71.	RPS		3 Nos.
72.	CRO		1 No.
73.	PLC trainer		1 No.
74.	AF Oscillator		1 No.
75.	Foam extinguisher		1 No.
76.	Dry extinguisher (powder)		1 No.
77.	Carbon dioxide Extinguisher		1 No.
78.	Sand bucket		1 No.
79.	Dry cell		1 No.
80.	Lead Acid battery	12 V, 10 AH	1 No.
81.	Rheostat	50 ohms' /5A	4 Nos.
82.	Ceramic Resistor	10 ohms, 22 ohms, 68 ohms, 100 ohms, 47 ohms	3 Sets.
83.	Load resistance		1 Set.

84.	Resistor	58 k ohms, 2 ohms, 100 ohms	1 Set.
85.	Rheostat	750 ohms, 1.2 ohms	1 Set.
86.	Capacitor	60 uF	1 Set.
87.	Inductor	95 Mh	1 Set.
88.	Wiring Tool kit		3 Nos.
89.	Sodium vapour lamp		2 Nos.
90.	Mercury lamp		2 Nos.
91.	Megger Earth electrode	25 million to 1550 ohms	1 No.
92.	Festo Trainer Kit		1 No.
C. GENERAL SHOP OUTFIT			
93.	Pliers side cutting	200 mm	10 Nos.
94.	Pliers Flat nose	150 mm	5 Nos.
95.	Pliers round nose		5 Nos.
96.	Pliers long nose		10 Nos.
97.	Screw driver heavy duty	250 mm	10 Nos.
98.	Screw driver Square blade	7 mm X 300 mm	10 Nos.
99.	Firmer Chisel	25 m	10 Nos.
100.	Firmer Chisel	10 mm	10 Nos.
101.	Marking Gauge		5 Nos.
102.	Combination bevel Protractor		3 Nos.
103.	Cold Chisel flat	25x200 mm	4 Nos.
104.	Cold Chisel flat	18 X200 mm	4 Nos.
105.	Hammer Ball Pein	0.5 kg.	5 Nos.
106.	Hammer Ball Pein	0.75 kg.	5 Nos.
107.	Hammer Ball Pein	1 kg.	5 Nos.
108.	Hammer Cross Pein	0.5 kg.	5 Nos.
109.	Wall jumper Octagonal	37 mmX450 mm, 37 mmX600mm	2 Each
110.	Centre Punch	100 mm	5 Nos.
111.	File flat	300 mm rough	5 Nos.
112.	File flat	300 mm 2 nd. Cut	5 Nos.
113.	File flat	250 mm Bastard	5 Nos.
114.	File flat	250 mm smooth	5 Nos.
115.	File half round	300 mm 2 nd cut	5 Nos.
116.	File Triangular	150 mm 2 nd cut	4 Nos.
117.	Spanner double ended	set of 6	5 Sets
118.	Adjustable Spanner	350 mm	2 Sets
119.	Foot Print grip	250 mm	2 Set
120.	Allen keys	(Metric & Inches)	20 Sets
121.	Steel Rule	30 cm	5 Nos.
122.	Steel Measuring Tape	2 m	5 Nos.
123.	Steel Measuring Tape	20m	2 Nos.
124.	Hacksaw frame Adjustable	200 mm to 300mm	5 Nos.
125.	Spirit level	300 mm	3 Nos.

126.	Bench vice	150 mm	3 Nos.
127.	Bench vice	100 mm	2 Nos.
128.	Pipe Wrench	300 mm	10 Nos.
129.	Spanner	up to 32 mm	10 Nos.
130.	Vernier caliper		2 Nos.
131.	Ring spanner		3 Set
132.	grip Plier	12"	4 Nos.
133.	Inner caliper		5 Nos.
134.	Outer caliper		5 Nos.
135.	Box spanner		4 Set
136.	Torque spanner		3 Nos.
137.	File Swiss type needle set		5 Nos.
138.	Shore hardness tester for rubber		1 No.
139.	Needle file		3 Set
140.	Nylon hammer		5 Nos.
141.	Puller	2 arm, 3 arm	3 Each
142.	Copper tube cutter		3 Nos.
143.	Ratchet brace	6 mm capacity	5 Nos.
144.	Ratchet bit	4 mm and 6 mm	5 Nos.
145.	Vernier Caliper	200 mm (ordinary)	5 Nos.
146.	Snips		5 Nos.
147.	Conduit Pipe die set		5 Nos.
148.	Tong Tester		2 Nos.
149.	Ohm meter		2 Nos.
150.	Grimping tool	Manual	1 No.
151.	Blow Lamp		2 Nos.
152.	Multimeter		2 Nos.
153.	Ladle		5 Nos.
154.	Pipe Vice	18"	2 Nos.
Note: - All the tools and equipment are to be procured as per BIS specification.			

TOOLS & EQUIPMENT FOR EMPLOYABILITY SKILLS		
S No.	Name of the Equipment	Quantity
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 nos.
2.	UPS – 500Va	10 nos.
3.	Scanner cum Printer	1 no.
4.	Computer Tables	10 nos.
5.	Computer Chairs	20 nos.
6.	LCD Projector	1 no.
7.	White Board 1200mm x 900mm	1 no.

Note: Above Tools & Equipment not required, if Computer LAB is available in the institute.



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FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor:			Year of Enrollment:											
Name & Address of ITI (Govt./Pvt.) :			Date of Assessment:											
Name & Address of the Industry:			Assessment location: Industry / ITI											
Trade Name:		Semester:		Duration of the Trade/course:										
Learning Outcome:														
S No	Maximum Marks (Total 100 Marks)		15	5	10	5	10	10	5	10	15	15	Total Internal Assessment Marks	Result (Y/N)
	Candidate Name	Father's/Mother's Name	Safety Consciousness	Workplace Hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written Instructions	Application of Knowledge	Skills to Handle Tools & Equipment	Economical Use of Materials	Speed in Doing Work	Quality in Workmanship	VIVA		
1														
2														