

MECHANIC MECHATRONICS

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5



SECTOR – INDUSTRIAL AUTOMATION AND INSTRUMENTATION



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

MECHANIC MECHATRONICS

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Skill India
कौशल भारत - कुशल भारत

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City,
Kolkata – 700 091

ACKNOWLEDGEMENT

The DGT sincerely expresses appreciation for the contribution of the Industry, State Directorate, Trade Experts and all others who contributed in revising the curriculum. Special acknowledgement to the following industries/organizations who have contributed valuable inputs in revising the curricula through their expert members:

1. Ordnance Factory, Medak
2. Voith Turbo, Hyderabad
3. Nuclear Fuel Complex, Hyderabad
4. Hindustan Fluorocarbon Ltd., Hyderabad
5. NVIS Technologies, Hyderabad
6. Sciencetech Technologies P. Ltd., Hyderabad
7. Bharat Electronics Ltd., Hyderabad.
8. ECIL, Hyderabad.

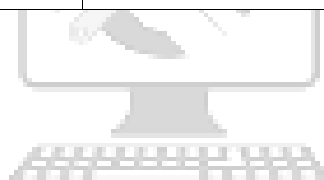
Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

Co-ordinator for the course: Sh. Shri L. K. Mukherjee, DDT & P. G. Rajendran, ADT

Sl. No.	Name & Designation Shri/Mr./Ms.	Organization	Mentor Council Designation
Expert group on restructuring of Apprenticeship Training Modules			
1.	L. K. Mukherjee, DDT	CSTARI, Kolkata	Expert
2.	P. G. Rajendran, ADT	ATI-EPI, Hyderabad.	Expert
3.	D. Srinivasa Rao, DDT	ATI (V), Hyderabad.	Expert
4.	D. Subhashree, DDT	AHI, Bangalore	Expert
5.	N. Sabhapathi, Additional Manager	Nuclear Fuel Complex, Hyderabad	Expert
6.	G. Pradeep Kumar, Dy. Manager	Nuclear Fuel Complex, Hyderabad	Expert
7.	G. S. Sastry, Manager (C&I)	Voith Turbo, Hyderabad	Expert
8.	Sanjay Mahagankar, Manager (Inst)	Hindustan Fluorocarbon Ltd., Hyderabad	Expert

MECHANIC MECHATRONICS

9.	M. Abhinav Karthik, Sr. Manager Engineer	NVIS Technologies, Hyderabad	Expert
10.	Vijay Singh Kushwah, Branch Manager	Scientech Technologies P. Ltd., Hyderabad	Expert
11.	G. Satyanarayana, Jr. Works Manager	Ordinance Factory, Medak	Expert
12.	P. Bheeshma Chary, Jr. Works Manager	Ordinance Factory, Medak	Expert
13.	V. Ramesh, Asst. Director	Ordinance Factory Learning Institute. Medak	Expert
14.	A. Jagadeeshwar, Sr.DGM(Assy.&PIng)	Bharat Electronics Ltd., Hyderabad.	Expert
15.	M. Balaiah, Manager (Assembly)	Bharat Electronics Ltd., Hyderabad.	Expert
16.	K. C. Meenakshisundaram	ECIL, Hyderabad.	Expert



Skill India
कौशल भारत - कुशल भारत

Sl. No.	Topics	Page No.
1.	Background	1-2
2.	Training System	3-7
3.	Job Role	8
4.	NSQF Level Compliance	9
5.	General Information	10
6.	Learning Outcome	11-13
7.	Learning Outcome with Assessment Criteria	14-16
8.	Syllabus	17-27
9.	Syllabus - Core Skill	
	9.1 Core Skill – Workshop Calculation & Science and Engineering Drawing	28-31
	9.2 Core Skill – Employability Skill	32-35
10.	Details of Competencies (On-Job Training)	36-37
11.	List of Trade Tools & Equipment Basic Training - Annexure I	38-44
12.	Format for Internal Assessment -Annexure II	45

1. 1 Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry. There are four categories of apprentices namely; **trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

1. 2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.



Skill India
कौशल भारत - कुशल भारत

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

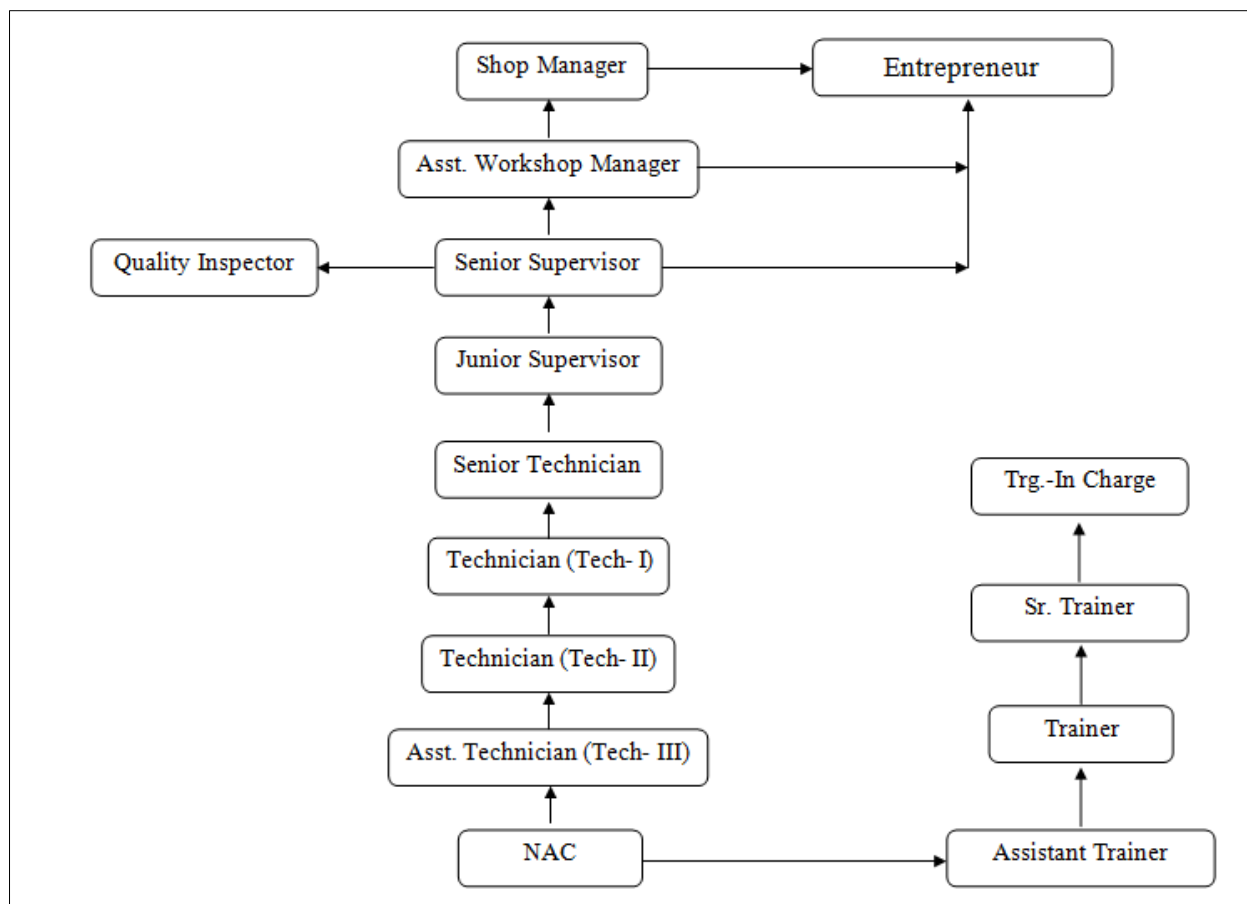
MECHANIC MECHATRONICS trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs and solve problem during execution.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

2.2 CAREER PROGRESSION PATHWAYS:

- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*): -

Total training duration details: -

Time (in months)	1-3	4-12	13-15	16-24
Basic Training	Block– I	-----	Block – II	-----
Practical Training (On - job training)	----	Block – I	-----	Block – II

A. Basic Training

For 02 yrs. course (Engg.):-(**Total 06 months:** 03 months in 1styr. + 03 months in 2nd yr.)

For 01 yr. course (Engg.):-(**Total 03 months:** 03 months in 1styr.)

S No.	Course Element	Total Notional Training Hours	
		For 02 Yrs. course	For 01 Yr. course
1.	Professional Skill (Trade Practical)	550	275
2.	Professional Knowledge (Trade Theory)	240	120
3.	Workshop Calculation & Science	40	20
4.	Engineering Drawing	60	30
5.	Employability Skills	110	55
	Total (Including internal assessment)	1000	500

B. On-Job Training:-

For 02 yrs. Course (Engg.) :-(**Total 18 months:** 09 months in 1styr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course (Engg.) :-(**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 yrs. course (Engg.)	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. course (Engg.)	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

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 have to maintain 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 NAC will be conducted by NCVT on completion of course as per guideline of Govt 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 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

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

2.4.2 ASSESSMENT GUIDELINE

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

Assessment will be evidence based comprising 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 examination 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 with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b) Weightage in the range of above 75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Weightage 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% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

Brief description of Job roles:

The breakdown cost of CNC machines and other Mechatronics systems is very high. The role of Mechanic Mechatronics is very important in the industry to keep the breakdown cost to minimum.

The job roles expected from Mechanic Mechatronics is described below:

- To repair and maintain CNC machines and other Mechatronics systems in working condition.
- To analyze the alarm messages displayed by the CNC system, to take backup of NC/PLC / Drive data, to install drives (axis & spindle) and to initiate necessary action to solve the problem.
- To establish communication between the CNC controller & PC through Ethernet Port, create new alarm msgs and read the various machine parameters
- Read and understand the circuit diagrams of hydraulics, pneumatics, PLC system, electrical and electronics to analyze the problem for solution.
- To coordinate with the production section to ensure strict adherence to the daily, weekly, quarterly maintenance schedules of the CNC machines and other Mechatronics systems to avoid costly breakdowns.
- To plan and execute preventive maintenance of CNC machines and other Mechatronics systems to avoid breakdowns.
- To dismantle Mechatronics systems like spindle assembly, ball screw, gear box, feed mechanism, lubrication system, coolant system, feedback devices, check different parts, make necessary repairs and reassemble the systems.
- To check the repaired and reassembled systems for proper functioning and fit them in the machine.
- To advice management in maintenance of necessary spares inventory of CNC machines to reduce breakdown time.

Reference NCO: 1) 7233.1200
2) 7233.1600

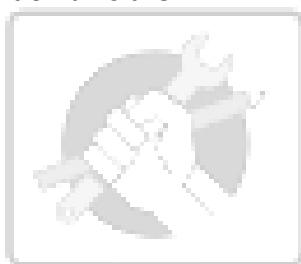
NSQF level for Mechanic Mechatronics trade under ATS: **Level 5**

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 and
- e. Responsibility.



The Broad Learning outcome of MECHANIC MECHATRONICS trade under ATS 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 works and learning.

Name of the Trade	Mechanic Mechatronics
NCO – 2015	7233.1200 7233.1600
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months Total duration of Basic Training: 6 months
Duration of On-Job Training	a) Block–I: 9 months b) Block–II : 9 months Total duration of Practical Training: 18 months
Entry Qualification	Passed 10 th Class with Science and Mathematics under 10+2 system of Education or its equivalent
Selection of Apprenticeship	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic Training	As per related trade of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	01 year
CTS trades eligible for Mechanic Mechatronics	1. Mechanic Mechatronics 2. Mechanic Machine Tool Maintenance

Note:

- Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.
- For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.

6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the MECHANIC MECHATRONICS course of 02 years duration under ATS.

Block I & II:-

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, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*
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

Block – I

1. Filing skills for precision fitting: Surface flatness, perpendicularity, Angular surface, Radius, balancing of file, draw filing, etc.
2. Drilling, reaming and tapping skills: on drilling machine, sensitive drilling machine, hand reaming, machine reaming, hand tapping, etc.
3. Lathe machine: Maintenance and repairing skills of lathe machine. Dismantling and assembling of gear box, feed mechanism, etc.

MECHANIC MECHATRONICS

4. Milling machine: Maintenance and repairing skills of milling machine. Dismantling and assembling of gear box, feed mechanism, etc.
5. Grinding machine: Maintenance and repairing skills of grinding machine. Dismantling and assembling of gear box, feed mechanism, etc.
6. Drilling machine: Maintenance and repairing skills of bench drilling and pillar type drilling machines.
7. Soldering skills, SMD soldering
8. Machine leveling skills for lathe, milling, grinding machines. Test reports against standards.
9. Guideways adjustment skills and Machine alignment setting skills: for lathe, milling, grinding machines.
10. Bearing Maintenance: mounting of bearings with proper fit & axis alignment, bearing removal from shafts, use of proper tools like pullers, etc.
11. Dismantling, maintenance, repair and assembling skills of simple mechanisms such as machine vice, three jaw chuck, tail stock, index head, coolant pump, etc.
12. Gear repairing and fitting skills: spur, helical, bevel gears, worm and worm wheels, rack and pinion, etc.
13. Test various electrical/electronic components using proper measuring instruments.
14. Assemble various electronic circuits using SMD components and test them using suitable test equipment and perform the repair work on the PCB tracks.

Block – II

15. Understand and apply the principle of electronic sensors, mechanical actuators and computer control. Install, test, and troubleshoot sensors, switches, and other control devices.
16. Hydraulic circuits: reading and construction skills, setting of hydraulic elements for proper functioning, trouble shooting in hydraulics, repair and maintenance of hydraulic valves, etc.
17. Pneumatic circuits: reading and construction skills, setting of pneumatic elements for proper functioning, trouble shooting in Pneumatics, repair and maintenance of pneumatic valves, etc.
18. Understand pneumatic/hydraulic and VFD/electric-motor control diagrams and construct them with appropriate hardware.
19. Install, integrate and troubleshoot servo and stepper motor controls
20. Understand and apply program on mechatronics modules and systems, especially PLCs, connect and configure PLC networks and data transfer using bus systems.
21. Understand and apply the principle of operation of mechatronics systems
22. Demonstration of the procedure of Installation and commissioning of CNC machine.
23. CNC Machine spindle assembly: spindle play setting, runout inspection, repair, etc.

MECHANIC MECHATRONICS

24. Ball screw assembly: ball screw mounting, preloading, assembling, lubrication, dismantling, repair, etc.
25. Feedback devices: proper setting, repair and maintenance of feedback elements, etc.
26. Lubrication & Coolant system of CNC Machines: Centralized lubrication system, friction, guide ways, repair, etc.
27. Preventive maintenance skills of CNC machines: Daily, weekly, quarterly maintenance schedules to avoid breakdowns.
28. Understand and apply CNC Programming.

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



Skill India
कौशल भारत - कुशल भारत

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
Learning Outcomes	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 including basic	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 treatment, centre of gravity, friction.

MECHANIC MECHATRONICS

electrical and apply in day to day work. <i>[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]</i>	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.
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 calipers, 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

MECHANIC MECHATRONICS

6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available resources optimally & remain sensitive to avoid environment pollution.
	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7.1 Explain personnel finance and entrepreneurship.
	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.
	7.3 Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize the work related to the occupation.	8.1 Use documents, drawings and recognize hazards in the work site.
	8.2 Plan workplace/ assembly location with due consideration to operational stipulation
	8.3 Communicate effectively with others and plan project tasks
	8.4 Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.
SPECIFIC OUTCOME	
<u>Block-I & II</u>	
<i>Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under block – I & block – II (section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of Planning (Identify, ascertain, estimate etc.); Execution (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3) Desired Mathematical Skills and some skill of collecting and organizing information, communication) and Checking/ Testing to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.</i>	

BASIC TRAINING (Block – I)**Duration: (03) Three Months**

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	- Importance of trade training, List of tools & Machinery used in the trade. - Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). - First Aid Method and basic training - Safety signs for Danger, Warning, caution & personal safety message - Preventive measures for electrical accidents & steps to be taken in such accidents. - Use of Fire extinguishers - Identification of tools & equipments as per desired specifications for marking & sawing.	All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. Job area after completion of training. Importance of safety and general precautions observed in the in the industry/shop floor. Introduction of First aid. Operation of electrical mains and electrical safety. Introduction of PPEs. Response to emergencies e.g.; power failure, fire, and system failure. Importance of housekeeping & good shop floor practices. Introduction to 5S concept & its application. Occupational Safety & Health: Health, Safety and Environment guidelines, legislations & regulations as applicable. Bench vice types, uses, care & maintenance, vice clamps. Measuring standards (English, Metric Units), Linear & angular measurements- their units. Try square, ordinary depth gauge, protractor- description, uses and cares.
2	- Filing Channel, Parallel. - Filing practice, surface filing, marking of straight and parallel lines with odd leg calipers and steel rule. - Marking off straight lines and ARCs using scribing block and dividers. - Chipping flat surfaces along a marked line. - Marking, filing, filing square and	Files- specifications, description, materials, grades, cuts, file elements, uses. Types of files, care and maintenance of files. Marking off and layout tools, dividers, scribing block, punches- description, classification, material, care & maintenance. Calipers- types, uses & care. Surface plate and auxiliary marking equipment, 'V' block, angle plates, parallel block, description, types, uses. Different types of hammers & uses.

	check using tri-square.	Physical properties of engineering metal: colour, weight, structure, and conductivity, magnetic, fusibility, specific gravity. Mechanical properties: ductility, malleability hardness, brittleness, toughness, tenacity, and elasticity.
3	13. Marking according to simple blue prints for locating, position of holes, scribing lines on chalked surfaces with marking tools. (20 hrs.) 14. Finding center of round bar with the help of 'V' block and marking block. (5 hrs.) 15. Filing flat, square, and parallel to an accuracy of 0.5mm. (10 hrs.) 16. Chipping, Chamfering, Chip slots & oils grooves (Straight). 17. Saw along a straight line, curved line, on different sections of metal.	Micrometer- outside and inside – principle, constructional features, parts graduation, leading, use and care. Micrometer depth gauge, parts, graduation, leading, use and care. Digital micrometer. Vernier calipers, principle, construction, graduations, reading, use and care. Vernier bevel protractor, construction, graduations, reading, use and care, dial Vernier Caliper, Digital verniercaliper.
4	18. Marking of straight lines, circles, profiles and various geometrical shapes and cutting the sheets with snips. 19. Marking out for flaps for soldering and sweating. 20. Make various joints: wiring, hemming, soldering and brazing, form locked, grooved and knocked up single hem straight and curved edges form double hemming,. 21. Practice in soft soldering and silver soldering.	Safety precautions to be observed in a sheet metal workshop, sheet and sizes, Commercial sizes and various types of metal sheets, coated sheets and their uses as per BIS specifications. Marking and measuring tools, wing compass, Prick punch, tin man's square tools, snips, types and uses. Tin man's hammers and mallets type-sheet metal tools. Various types of metal joints, their selection and application, tolerance for various joints, their selection & application. Wired edges. Solder and soldering: Introduction-types of solder and flux. Composition of various types of solders and their heating media of soldering iron. Method of soldering, selection and application-joints. Hard solder- Introduction, types and method of brazing.
5-6	22. Welding - Striking and maintaining ARC, laying Straight-line bead.	Drilling processes: common type (bench type, pillar type, radial type), gang and multiple drilling machine. Various rivets shape and form of heads,

	23. Making square, butt joint and 'T' fillet joint-gas and ARC. 24. Do setting up of flames, fusion runs with and without filler rod, and gas. 25. Make butt weld and corner, fillet in ARC welding (25 hrs.) 26. Gas cutting of MS plates (25 hrs.) 27. File steps and finish with smooth file to accuracy of ± 0.25 mm.	importance of correct head size. Riveting tools, dolly snaps description and uses. Method of riveting, The spacing of rivets, comparison of hot and cold riveting. Importance of safety and general precautions observed in a welding shop. Precautions in electric and gas welding. (Before, during, after) Machines and accessories, welding transformer, welding generators. Welding hand tools: Hammers, welding description, types and uses, description, principle, method of operating, carbon dioxide welding. H.P. welding equipment: description, principle, method of operating L.P. welding equipment: description, principle, method of operating. Types of Joints-Butt and fillet <u>as per BIS SP: 46-1988</u> specifications. Gases and gas cylinder description, kinds, main difference and uses. Setting up parameters for ARC welding machines-selection of Welding electrodes. Care to be taken in keeping electrode. Oxygen acetylene cutting-machine description, parts, uses, method of handling, cutting torch-description, parts, function and uses.
7	28. Mark off and drill through holes. 29. Drill on M.S. flat. 30. Make riveted lap and butt joint. 31. Riveting with as many types of rivet as available, use of counter sunk head rivets. 32. Practice use of angular measuring instrument.	Screw threads: terminology, parts, types and their uses. Determination of tap drill size. Screw pitch gauge: material parts and uses. Taps British standard (B.S.W., B.S.F., B.A. & B.S.P.) and metric /BIS (course and fine) material, parts (shank body, flute, cutting edge). Tap wrench: material, parts, types (solid & adjustable types) and their uses removal of broken tap, studs (tap stud extractor). Dies: British standard, metric and BIS standard, material, parts, types, Method of using dies. Die stock: material, parts and uses.
8	33. Counter sink, counter bore and ream split fit (three piece fitting). 34. Form internal threads with taps to	Drill- material, types, (Taper shank, straight shank) parts and sizes. Drill angle-cutting angle for different materials, cutting speed

	standard size (through holes and blind holes). 35. Prepare studs and bolt. 36. Form external threads with dies to standard size. 37. Prepare nuts and match with bolts.	feed. R.P.M. for different materials. Drill holding devices- material, construction and their uses. Counter sink, counter bore and spot facing-tools and nomenclature, Reamer-material, types (Hand and machine reamer), kinds, parts and their uses, determining hole size (or reaming), Reaming procedure. Drill troubles: causes and remedy. Equality of lips, correct clearance, dead centre, length of lips. Grinding wheel: Abrasive, grade structures, bond, specification, use, mounting and dressing. Selection of grinding wheels. Bench grinder parts and use. Radius/fillet gauge, feeler gauge, hole gauge, and their uses, care and maintenance.
9	38. Make sliding 'T' fit. 39. Make sliding fit with angles other than 90°	Interchangeability: Necessity in Engg, field definition, BIS. Definition, types of limit, terminology of limits and fits-basic size, actual size, deviation, high and low limit, zero line, tolerance zone Different standard systems of fits and limits. British standard system, BIS system Method of expressing tolerance as per BIS Fits: Definition, types, description of each with sketch. Vernier height gauge: material construction, parts, graduations (English & Metric) uses, care and maintenance.
10	40. File and make Step fit, angular fit, angle, surfaces (Bevel gauge accuracy 1 degree).(15 hrs.) 41. Make simple open and sliding fits.(10 hrs.) 42. Scrap on flat surfaces, curved surfaces and parallel surfaces and test. 43. Check for blue math of bearing surfaces- both flat and curved surfaces by wit worth method.	Pig Iron: types of pig Iron, properties and uses. Cast Iron: types, properties and uses. Wrought iron- : properties and uses. Steel: plain carbon steels, types, properties and uses. Non-ferrous metals (copper, aluminum, tin, lead, zinc) properties and uses. Simple scraper- circular, flat, half round, triangular and hook scraper and their uses. Blue matching of scraped surfaces (flat and curved bearing surfaces) Vernier micrometer, material, parts, graduation, use, care and maintenance. Calibration of measuring instruments. Introduction to mechanical fasteners and its uses.

		Dial test indicator, construction, parts, material, graduation, Method of use, care and maintenance. Digital dial indicator. Comparators-measurement of quality in the cylinder bores.
11-12	44. True job on four jaw chuck using knife tool. 45. Face both the ends for holding between centers. 46. Using roughing tool parallel turn ± 0.1 mm. 47. Holding job in three jaw chuck. 48. Perform the facing, plain turn, step turn, parting, deburr, chamfer-corner, round the ends, and use form tools. 49. Cut grooves- square, round, 'V' groove. 50. Knurl the job. 51. Bore holes –spot face, pilot drill, enlarge hole using boring tools. 52. Turn taper (internal and external). 53. Make external 'V' thread.	Safely precautions to be observed while working on a lathe, Lathe specifications. Lathe main parts descriptions- bed, head stock, carriage, tail stock, feeding and thread cutting mechanisms. Holding of job between centers and their applications. Lathe cutting tools- Nomenclature of single point & multipoint cutting tools, Tool selection based on different requirements and necessity of correct grinding, solid and tipped, throw away type tools, cutting speed and feed and comparison for H.S.S., carbide tools. Use of coolants and lubricants. Chucks and chucking the independent four-jaw chuck. Reversible features of jaws, the back plate, Method of clearing the thread of the chuck-mounting and dismounting, chucks, chucking true, face plate, drilling - method of holding drills in the tail stock, Boring tools and enlargement of holes. General turning operations- parallel or straight, turning. Stepped turning, grooving, and shape of tools for the above operations. Knurling: - tools description, grade, uses, speed and feed, coolant for knurling, speed, feed calculation. Taper – definition, use and method of expressing tapers. Standard tapers-taper, calculations morse taper. Screw thread definition – uses and application. Square, worm, buttress, acme (non standard-screw threads), Principle of cutting screw thread in centre lathe –principle of chasing the screw thread – use of centre gauge, setting tool for cutting internal and external threads, use of screw pitch gauge for checking the screw thread.

13	54. Perform the routine maintenance with check list. 55. Monitor machine as per routine checklist 56. Read pressure gauge, temperature gauge, oil level. 57. Set pressure in pneumatic system.	Maintenance -Total productive maintenance -Autonomous maintenance -Routine maintenance -Maintenance schedule -Retrieval of data from machine manuals Preventive maintenance-objective and function of Preventive maintenance, section inspection. Visual and detailed, lubrication survey, system of symbol and colour coding. Revision, simple estimation of materials, use of handbooks and reference table. Possible causes for assembly failures and remedies. Assembling techniques such as aligning, bending, fixing, mechanical jointing, threaded jointing, sealing, and torquing. Dowel pins: material, construction, types, accuracy and uses.
Assessment/Examination 03days		

NOTE: -

More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.

BASIC TRAINING (Block – II)**Duration: (03) Three Months**

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	58. File & fit angular mating surface within an accuracy of ± 0.02 mm & 10 minutes angular fitting.	Screws: material, designation, specifications, Property classes (e.g. 9.8 on screw head), Tools for tightening/ loosening of screw or bolts, Torque wrench, screw joint calculation uses. Power tools: its uses & maintenance. Locking device: Nuts- types (lock nut castle nut, slotted nuts, swam nut, grooved nut) description and use. Various types of keys, allowable clearances & tapers, types, uses of key pullers.
2	59. Drilling and reaming, small dia. holes to accuracy & correct location for fitting. 60. Perform drilling using 'V' block and a clamp. 61. Make male and female fitting parts, drill and ream holes not less than 12.7 mm.	Templates and gauges- Introduction, necessity, types. Limit gauge: Ring gauge, snap gauge, plug gauge, description and uses. Description and uses of gauge- types (feeler, screw, pitch, radius, wire gauge) Slip gauge: Necessity of using, classification & accuracy, set of blocks (English and Metric). Details of slip gauge. Metric sets 46: 103: 112. Wringing and building up of slip gauge and care and maintenance. Application of slip gauges for measuring, Sine bar- Principle, application & specification. Procedure to check adherence to specification and quality standards.
3	62. Lap flat surfaces using lapping plate. Lapping holes and cylindrical surfaces. 63. Scrapping cylindrical bore and to make a fit.	Lapping: Application of lapping, material for lapping tools, lapping abrasives, charging of lapping tool. Surface finish importance, equipment for testing-terms relation to surface finish. Equipment for testing surfaces quality – dimensional tolerances of surface finish. Honing: Application of honing, material for honing, tools shapes, grades, honing abrasives. Frosting- its aim and the methods of performance.
4	64. Prepare Stepped keyed fitting and test job.	Tapers on keys and cotters permissible by various standards. Gauges and types of gauge commonly used in gauging finished product-Method of selective

		assembly 'Go' system of gauges, hole plug basis of standardization. Metallurgical and metal working processes such as Heat treatment, various heat treatment methods -normalizing, annealing, hardening and tempering, purpose of each method, tempering colour chart. Annealing and normalizing, Case hardening and carburising and its methods, process of carburising (solid, liquid and gas).
5	65. Identify different ferrous metals by spark test. 66. File and fit straight and angular surfaces internally.	Bearing-Introduction, classification (Journal and Thrust), Description of each, ball bearing: Single row, double row, description of each, and advantages of double row. Roller and needle bearings: Types of roller bearing. Description & use of each. Method of fitting ball and roller bearings Bearing metals – types, composition and uses. Synthetic materials for bearing: The plastic laminate materials, their properties and uses in bearings such as phenolic, teflon polyamide (nylon).
6-7	67. Flaring of pipes and pipe joints. 68. Cutting & Threading of pipe length 69. Fitting of pipes as per sketch observing conditions used for pipe work. 70. Bending of pipes- cold and hot. 71. Dismantling & assembling – globe valves, sluice valves,	Pipes and pipe fitting- commonly used pipes. Pipe schedule and standard sizes. Pipe bending methods. Use of bending fixture, pipe threads- Std. Pipe threads Die and Tap, pipe vices. Use of tools such as pipe cutters, pipe wrenches, pipe dies, and tap, pipe bending machine etc. Standard pipefitting- Methods of fitting or replacing the above fitting, repairs and erection on rainwater drainage pipes and house hold taps

	stop cocks, seat valves and non-return valve. 72. Fit & assemble pipes, valves and test for leakage & functionality of valves. 73. Visual inspection for visual defects e.g. dents, surface finish. 74. Measuring, checking and recording in control chart.	and pipe work. Jigs & Fixtures- their applications and difference. Drilling jig-constructional features, types and uses. Fixtures-Constructional features, types and uses. Different types of jig bush, care & maintenance if jigs and fixtures.
8	75. Drilling and reaming holes in correct location, fitting dowel pins, stud, and bolts.	Aluminium and its alloys. Uses, advantages and disadvantages, weight and strength as compared with steel. Non-ferrous metals such as brass, phosphor bronze, gunmetal, copper, aluminium etc. Their composition and purposes, where and why used, advantages for specific purposes, surface wearing properties of bronze and brass. Inspection & Quality control -Basic SPC -Visual Inspection
9	76. Making & replacing damaged keys. 77. Repair of broken gear tooth by stud and repair broken gear teeth by dovetail.	Power transmission elements. The object of belts, their sizes and specifications, materials of which the belts are made, selection of the type of belts with the consideration of weather, load and tension methods of joining leather belts. Vee belts and their advantages and disadvantages, Use of commercial belts, dressing and resin creep and slipping, calculation. Power transmissions- coupling types-flange coupling,-Hooks coupling-universal coupling and their different uses. Pulleys-types-solid, split and 'V' belt pulleys, standard calculation for determining size crowning of faces-loose and fast pulleys-jockey pulley. Types of drives-open and cross belt drive. Power transmission –by gears, most common form spur gear, set names of some essential parts of the set-The pitch circles, Diametral pitch, velocity ratio of a gear set.

		Helical gear, herring bone gears, bevel gearing, spiral bevel gearing, hypoid gearing, pinion and rack, worm gearing, velocity ratio of worm gearing. Repair of gear teeth by building up and dovetail method.
10-12	78. Identify pneumatic components – Compressor, pressure gauge, Filter-Regulator-Lubricator (FRL) unit, and Different types of valves and actuators. 79. Dismantle, replace, and assemble FRL unit 80. Identify the parts of a pneumatic cylinder 81. Construct a control circuit for the control of a d/a pneumatic cylinder with momentary input signals 82. Construct a circuit for the direct & indirect control of a d/a pneumatic cylinder with a single & double solenoid valve 83. Demonstrate knowledge of safety procedures in hydraulic systems (Demo by video) 84. Identify hydraulic components – Pumps, Reservoir, Fluids, Pressure relief valve (PRV), Filters, different types of valves, actuators, and hoses 85. Identify internal parts of hydraulic cylinders, pumps/motors. 86. Construct a circuit for the control of a s/a hydraulic cylinder using a 3/2-way valve (Weight loaded d/a cylinder may be used as a s/a cylinder), 4/2 & 4/3 way valves.	Fluid power, Pneumatics, Hydraulics, and their comparison, Overview of a pneumatic system. Compressed air generation and conditioning, Air compressors, Pressure regulation, Dryers, Air receiver, Conductors and fittings, FRL unit, Applications of pneumatics, Hazards & safety precautions in pneumatic systems. Pneumatic actuators:- Types, Basic operation, Force, Stroke length, Single-acting and double-acting cylinders. Pneumatic valves:- Classification, Symbols of pneumatic components, 3/2-way valves (NO & NC types) (manually-actuated & pneumatically-actuated) & 5/2-way valves, Check valves, Flow control valves, One-way flow control valve Pneumatic valves: Roller valve, Shuttle valve, Two-pressure valve - Electro-pneumatics: Introduction, 3/2-way single solenoid valve, 5/2-way single solenoid valve, 5/2-way double solenoid valve, Control components -Pushbuttons (NO & NC type) and Electromagnetic relay unit, Logic controls - Symbols of hydraulic components, Hydraulic oils –function, properties, and types, Contamination in oils and its control - Hydraulic Filters – types, constructional features, and their typical installation locations, cavitation, Hazards & safety precautions in hydraulic systems - Hydraulic reservoir & accessories, Pumps, Classification – Gear/vane/ piston types, Pressure relief valves – Direct acting and pilot-operated types - Pipes, tubing, Hoses and fittings – Constructional details, Minimum bend radius, routing tips for hoses - Hydraulic cylinders –Types

		- Hydraulic motors –Types - Hydraulic valves: Classification, Directional Control valves – 2/2- and 3/2-way valves - Hydraulic valves: 4/2- and 4/3-way valves, Centre positions of 4/3-way valves - Hydraulic valves: Check valves and Pilot-operated check valves, Load holding function - Flow control valves: Types, Speed control methods – meter-in and meter-out - Preventive maintenance & troubleshooting of pneumatic & hydraulic systems, System malfunctions due to contamination, leakage, friction, improper mountings, cavitation, and proper sampling of hydraulic oils
13	87. Simple repair of machinery: - Making of packing gaskets. 88. Perform routine check of machine and do replenish as per requirement. 89. Practicing, making various knots, correct loading of slings, correct and safe removal of parts. 90. Inspection of machine tools & accuracy testing of machine tools.	Clutch: Type, positive clutch (straight tooth type, angular tooth type) . Washers-Types and calculation of washer sizes. The making of joints and fitting packing. Chains, wire ropes and clutches for power transmission. Their types and brief description. Lubrication and lubricants- purpose of using different types, description and uses of each type. Method of lubrication. A good lubricant, viscosity of the lubricant, Main property of lubricant. Foundation bolt: types (rag, Lewis cotter bolt) description of each erection tools, pulley block, crow bar, spirit level, Plumb bob, wire rope, manila rope, wooden block. The use of lifting appliances, extractor presses and their use. Practical method of obtaining mechanical advantage. The slings and handling of heavy machinery, special precautions in the removal and replacement of heavy parts.
Assessment/Examination 03days		

NOTE: -

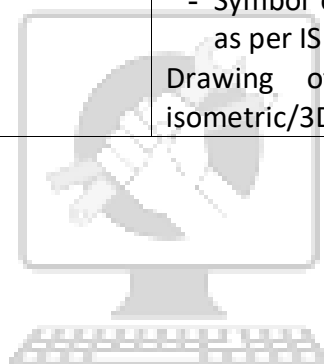
- *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	Workshop Calculation and Science (Duration: - 20 hrs.)	Engineering Drawing (Duration : - 30 hrs.)
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 - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003
2.	Fractions: Fractions, Decimal fraction, Addition, Subtraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Calculator.	Drawing Instruments : their 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.	Properties of Material : 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 Alloys.	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.	Average: Problems of Average. Ratio & Proportion : Simple calculation on related problems.	Drawing of Geometrical Figures: Drawing practice on: - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
5.	Mass, Weight and Density: Mass, Unit of Mass, Weight, difference	Dimensioning:

	between mass and weight, Density, unit of density.	- Definition, types and methods of dimensioning (functional, non-functional and auxiliary) - Types of arrowhead - Leader Line with text
6.	Percentage: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	<u>Free hand drawing of</u> - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension - Transferring measurement from the given object to the free hand sketches.
7.	- Forces definition. - Definition and example of compressive, tensile, shear forces, axial and tangential forces. Stress, strain, ultimate strength, factor of safety for MS. <u>Speed and Velocity:</u> Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation.	<u>Method of presentation of Engineering Drawing</u> - Pictorial View - Orthogonal View - Isometric view
8.	<u>Mensuration:</u> Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle. Volume of solids – cube, cuboids, cylinder and Sphere. Surface area of solids – cube, cuboids, cylinder and Sphere. - Area of cut-out regular surfaces: circle and segment and sector of circle. - Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple solid blocks.	<u>Symbolic Representation (as per BIS SP:46-2003) of :</u> - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings
9.	<u>Algebra</u> : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables). - Circular Motion: Relation between circular motion and Linear motion,	<u>Dimensioning practice:</u> - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance.

	Centrifugal force, Centripetal force.	
10.	<u>Work, Power and Energy:</u> work, unit of work, power, unit of power, Horse power, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.	<u>Construction of Geometrical Drawing Figures:</u> - Polygons and their values of included angles. Conic Sections (Ellipse)
11.		<u>Projections:</u> - 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. Drawing of Orthographic projection from isometric/3D view of blocks



Skill India
 कौशल भारत - कुशल भारत

Block – II		
Sl. No.	Workshop Calculation and Science (Duration: - 20 hrs.)	Engineering Drawing (Duration : - 30 hrs.)
1.	Trigonometry: Trigonometric ratios, Trigonometric tables. - Finding the value of unknown sides and angles of a triangle by Trigonometrical method. - Finding height and distance by trigonometry.	- Machined components; concept of fillet & chamfer; surface finish symbols.
2.	Friction and its application in Workshop practice.	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
3.	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.	- Reading & interpretation of assembly drawing and detailing.
4.	Basic Electricity: Introduction, use of electricity, 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. Concept of earthing.	- Reading of drawing. Simple exercises related to missing lines, dimensions and views. How to make queries.
5.	Heat treatment – Necessity, different common types of Heat treatment.	- Simple exercises related to trade related symbols. - Solution of NCVT test papers.
6.	Graph: - Read images, graphs, diagrams – bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	
7.	Transmission of power: By belt, pulleys & gear drive.	
8.	Concept of pressure – units of pressure, atmospheric pressure, gauge pressure – gauges used for measuring pressure. Introduction to pneumatics & hydraulics systems. Solution of NCVT test papers	

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)		
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 know, 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 messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.	
2. I.T. Literacy		Duration : 20 Hrs. Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of 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, Web Site, 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
Block – II Duration – 55 hrs.	
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. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions 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 familiarizes 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 improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected 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, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, 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. 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 House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below: -

1. Safety and best practices (5S, KAIZEN etc.)
2. Record keeping and documentation
3. Identification and testing of mechanical, hydraulic, pneumatic, electrical and electronic components/devices
4. Repair & Maintenance work

BLOCK – I

1. Filing skills for precision fitting: Surface flatness, perpendicularity, Angular surface, Radius, balancing of file, draw filing, etc.
2. Drilling, reaming and tapping skills: on drilling machine, sensitive drilling machine, hand reaming, machine reaming, hand tapping, etc.
3. Lathe machine: Maintenance and repairing skills of lathe machine. Dismantling and assembling of gear box, feed mechanism, etc.
4. Milling machine: Maintenance and repairing skills of milling machine. Dismantling and assembling of gear box, feed mechanism, etc.
5. Grinding machine: Maintenance and repairing skills of grinding machine. Dismantling and assembling of gear box, feed mechanism, etc.
6. Drilling machine: Maintenance and repairing skills of bench drilling and pillar type drilling machines.
7. Soldering skills, SMD soldering
8. Machine levelling skills for lathe, milling, grinding machines. Test reports against standards.
9. Guide ways adjustment skills and Machine alignment setting skills: for lathe, milling, grinding machines.
10. Bearing Maintenance: mounting of bearings with proper fit & axis alignment, bearing removal from shafts, use of proper tools like pullers, etc.
11. Dismantling, maintenance, repair and assembling skills of simple mechanisms such as machine vice, three jaw chuck, tail stock, index head, coolant pump, etc.
12. Gear repairing and fitting skills: spur, helical, bevel gears, worm and worm wheels, rack and pinion, etc.
13. Test various electrical/electronic components using proper measuring instruments.
14. Assemble various electronic circuits using SMD components and test them using suitable test equipment and perform the repair work on the PCB tracks.

BLOCK – II

15. Understand and apply the principle of electronic sensors, mechanical actuators and computer control. Install, test, and troubleshoot sensors, switches, and other control devices.
16. Hydraulic circuits: reading and construction skills, setting of hydraulic elements for proper functioning, trouble shooting in hydraulics, repair and maintenance of hydraulic valves, etc.
17. Pneumatic circuits: reading and construction skills, setting of pneumatic elements for proper functioning, trouble shooting in Pneumatics, repair and maintenance of pneumatic valves, etc.
18. Understand pneumatic/hydraulic and VFD/electric-motor control diagrams and construct them with appropriate hardware.
19. Install, integrate and troubleshoot servo and stepper motor controls
20. Understand and apply program on mechatronic modules and systems, especially PLCs, connect and configure PLC networks and data transfer using bus systems.
21. Understand and apply the principle of operation of mechatronic systems
22. Demonstration of the procedure of Installation and commissioning of CNC machine by taking back up of CNC/NC/PLC data, installing the drives, communicating with CNC controller through Ethernet port, creating and analyzing alarms
23. CNC Machine spindle assembly: spindle play setting, run out inspection, repair, etc.
24. Ball screw assembly: ball screw mounting, preloading, assembling, lubrication, dismantling, repair, etc.
25. Feedback devices: proper setting, repair and maintenance of feedback elements, etc.
26. Lubrication & Coolant system of CNC Machines: Centralized lubrication system, friction, guide ways, repair, etc.
27. Preventive maintenance skills of CNC machines: Daily, weekly, quarterly maintenance schedules to avoid breakdowns.
28. Understand and do CNC Programming.

Note:

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.
2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

MECHANIC MECHATRONICS			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
Sl. no.	Name of the Tool & Equipments	Specification	Quantity
A. TRAINEES TOOL KIT			
1.	Steel rule	300 mm graduated both side in Metric and English	21 Nos.
2.	Try square	150 mm	21 Nos.
3.	File flat bastard	300 mm	21 Nos.
4.	File flat 2 nd cut	250 mm	21 Nos.
5.	File flat smooth	200 mm	21 Nos.
6.	Round Nose Pliers	200 mm	21 Nos.
7.	Combination pliers	200 mm	21 Nos.
8.	Smooth Files:	half round 2 nd cut 250 mm; round and square 200 mm	21 Nos. each
9.	File three square smooth	200 mm	21 Nos.
10.	File needle set of 12 nos.		21 Nos.
11.	Allen Hexagonal keys	2 to 16 mm	21 Nos.
B: TOOLS, INSTRUMENTS AND GENERAL SHOP OUTFITS:			
12.	Tap and die	M6 to M 12 with tap wrench and die holder.	1 set
13.	Spanner socket set of 25 pieces	10 to 25, 27, 30, 32 mm = 18 pieces and accessories = 7 Nos.	1 set
14.	Pipe wrench	45 mm	1 No.
15.	Tap extractor		1 No.
16.	Stud extractor		1 No.
17.	Granite surface plate	1600 x 1000 with stand and cover.	1 No.
18.	Bearing and gear tester		1 No.
19.	Bar type torque wrench		1 No.

MECHANIC MECHATRONICS

20.	Circlip pliers	inside and outside and straight	1 set
21.	Hammer soft	faced 30 mm dia. Plastic tipped	1 No.
22.	Accumulator		1 No.
23.	Pneumatic tools (portable nut spanner/runner, chisel, grinder, sander and hammer)		1 each
24.	Hydraulic, pneumatic trainer with necessary aggregates for different machine circuit with all transparent valves and pressure gauge, reservoir etc.		1 each trainer
25.	Hydraulic valves (relief, sequence, pressure reducing, check, flow control, directional control valves etc.).		1 each
26.	Transparent hydraulic cylinders: single acting and double acting		1 each
27.	Vibrometer		1 No.
28.	Flow detector (magnetic crack detector)		1 No.
29.	Solenoid valve		1 No.
30.	Pneumatic meter		1 No.
31.	Head lamp		1 No.
32.	Master test bars (different size)		1 set
33.	Spirit Level		1 No.
34.	Self alignment roller ball bearing		1 No.
35.	Telescopic gauges	13 mm to 300 mm	1 set
36.	Gear pump		1 no.
37.	Vane pump fixed and variable delivery		1 each
38.	Hydrometer		1 No.
39.	Machine tool calibrator		1 No.
40.	Hydraulic wheel and bearing puller		1 No.
41.	Tube expander	up to 62 mm	1 set
42.	SRDG ball bearing, DRDG ball bearing, self aligning ball bearing, SRAC ball bearing, needle bearing, single row cylindrical roller Bearing, tapered roller bearing, plain bush bearing, thin walled bearing.		1 each
43.	Straight edge (steel)	1000 mm	1 No.

MECHANIC MECHATRONICS

44.	Sprit level		1 No.
45.	Spanner D.E. series 2		1 set
46.	Machine vice swivel base	160 mm	1 No.
47.	Twist drill	3 to 13 mm (Straight Shank)	1 set
48.	Twist drill 13 to 25 mm by 1 mm (Taper Shank)		1 set
49.	Grinding wheel dresser (diamond) 1.5 carat		1 set
50.	Hand reamer	6 to 25 mm by 1 mm	1 set
51.	Punch letter set	4 mm	1 No.
52.	Punch number set	4 mm	1 No.
53.	Mandrel	120 mm long different sizes	1 set
54.	Wheel balancing stand with its accessories		1 No.
55.	Machine reamer	6 to 25 mm by 1 mm	1 set.
56.	Engineers parallel blocks		1 set
PRECISION INSTRUMENTS:			
57.	Vernier calliper	200mm with inside and depth measurement	1 No.
58.	Outside micrometers:	0- 25; 25-50; 50-75; 75-100	1 each
59.	Sine bar	200 mm	1 No.
60.	Slip gauge metric set (for the whole institute)		1 set
61.	Feeler gauge and Radius gauge (metric)		1 each
62.	Indicator with magnetic base		1 No.
63.	Straight edge	485 mm to 1445 mm	1 No.
64.	Adjustable micrometer sprit level to measure flatness, indication and taper with prismatic measuring base		1 No.
ELECTRICAL TECHNOLOGY AND ELECTRONICS			
65.	Screw driver electrician	150 mm	21 Nos.
66.	Screw driver Philips Nos. 860, 862, 862		21 Nos.
67.	Long nose plier	150 mm insulated	21 Nos.
68.	Combination plier	150 mm	21 Nos.
69.	Diagonal cutter	150 mm	21 Nos.
70.	Tweezers		21 Nos.
71.	Knife	100 mm	21 Nos.
72.	Neon tester		21 Nos.
73.	Soldering iron	25 W	21 Nos.

MECHANIC MECHATRONICS

74.	Soldering iron	65 W	21 Nos.
75.	Multimeter		2 Nos.
76.	Ammeter	0 mA to 500 mA	1 No.
77.	Ammeter	0-1 A DC	1 No.
78.	Voltmeter	0-300-600 V AC	1 No.
79.	Discrete component trainer		1 No.
80.	P.F.Meter		1 No.
81.	Frequency meter		1 No.
82.	Megger	500 V.	1 No.
83.	AC squirrel cage induction motor 30 with D.O.L. starter		1 No.
84.	Star delta 30 starter		1 No.
85.	C.T. single phase		1 No.
86.	P.T. single phase		1 No.
87.	Auto transport	0-300 V, 8 Amp.	1 No.
88.	Audio signal generator		1 No.
89.	DC power supply	0-30 V, 2 Amp.	1 No.
90.	Demonstration model for thyristorised DC motor drive (1 HP) set up		1 No.
91.	Demonstration model for thyristorised AC motor drive (1 HP) set up.		1 No.
92.	Linear I.C. trainer		1 No.
93.	Digital multi-meter	2.5 Amps./5 Amps	1 No.
94.	Transducer		1 No.
95.	Thermocouple kit		1 No.
96.	L.D.R.S. kit		1 No.
97.	Thermister kit		1 No.
98.	L.V.D.T. kit		1 No.
99.	Photo diode		1 No.
100.	Photo transistor kit		1 No.
101.	AC timer kit		1 No.
102.	DC timer kit		1 No.
103.	Decimal counter kit		1 No.
104.	DC motor control kit		1 No.
105.	Hand tachometer		1 No.
106.	Ammeter portable type	0-15 Amps. AC	1 No.
107.	Insulated handle screw driver	200 mm	2 Nos.

MECHANIC MECHATRONICS

108.	Insulated handle combination side cutting plier	200 mm	2 Nos.
FURNITURE			
109.	Metal lockers 8-lockers type with individual locks	1980 x 910 x 480 mm	1 No.
110.	Office chair with arms		1 No.
111.	Office table		1 No.
112.	Work bench		2 nos.
113.	Metal shelving rack open type	1800 x 900 x 500 mm with adjustable shelves	2 Nos.
114.	Drawing desk		1 No.
115.	Stool		1 No.
116.	White board		1 No.
117.	Portable fire extinguisher.		1 No.
118.	Steel fire bucket	4 litres	2 Nos.
C: GENERAL MACHINERY INSTALLATIONS:			
119.	CNC Trainer		1 No.
120.	Lathe general purpose, all geared, height of center 150 mm, with 3 jaw and 4 jaw chuck, with all accessories		1 No.
121.	Drilling machine pillar type 20 mm capacity		1 No.
122.	Bench drilling machine 12 mm capacity		1 No.
123.	Bench grinder 250 mm dia. (lighter type)		1 No.
MACHINES FOR REPAIR AND RECONDITIONING			
124.	Old center lathe		1 No.
125.	Old milling machine (universal)		1 No.
126.	Old grinding machine (universal)		1 No.
127.	Old Universal indexing head		1 No.
128.	Old CNC lathe / CNC Milling machine / Machining center (Any one)		1 No.
Note: In case of basic training setup by the industry the tools, equipment and machinery available in the industry may also be used for imparting basic training.			

MECHANIC MECHATRONICS

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: MECHANIC MECHATRONICS LIST OF TOOLS& EQUIPMENTS FOR -20APPRENTICES

1) **Space Norms** : 45 Sq. m.(For Engineering Drawing)

2) **Infrastructure:**

A : TRAINEES TOOL KIT:-			
Sl. No.	Name of the items	Specification	Quantity
1.	Draughtsman drawing instrument box		20+1 set
2.	Set square celluloid 45° (250 X 1.5 mm)		20+1 set
3.	Set square celluloid 30°-60° (250 X 1.5 mm)		20+1 set
4.	Mini drafter		20+1 set
5.	Drawing board (700mm x500 mm) IS: 1444		20+1 set
B : Furniture Required			
Sl. No.	Name of the items	Specification	Quantity
1	Drawing Board		20
2	Models : Solid & cut section		as required
3	Drawing Table for trainees		as required
4	Stool for trainees		as required
5	Cupboard (big)		01
6	White Board (size: 8ft. x 4ft.)		01
7	Trainer's Table		01
8	Trainer's Chair		01

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. 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.
<i>Note: - Above Tools & Equipments not required, if Computer LAB is available in the institute.</i>		

Skill India
कौशल भारत - कुशल भारत

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:													
Sl. 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													