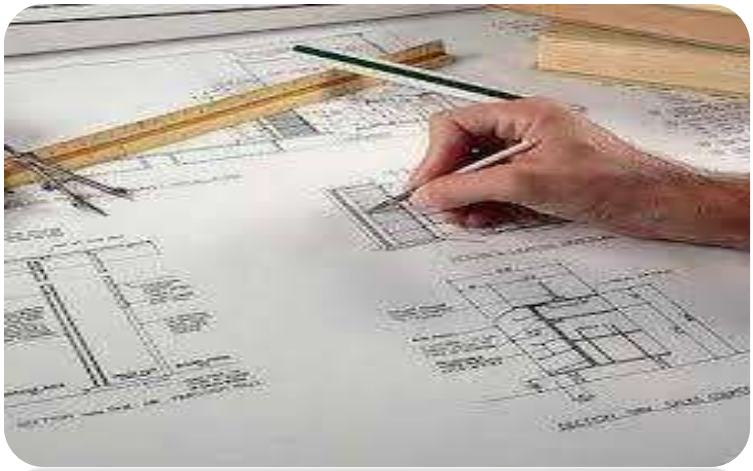
DRAUGHTSMAN MECHANICAL

NSQF LEVEL - 6



SECTOR - CAPITAL GOODS AND MANUFACTURING

COMPETENCY BASED CURRICULUM

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

GOVERNMENT OF INDIA
Ministry of Skill Development & Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City, Kolkata – 700091

DRAUGHTSMAN MECHANICAL

(Engineering Trade)

SECTOR – CAPITAL GOODS AND MANUFACTURING

(Revised in 2019)

Version 1.1

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Developed By
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1. COURSE OVERVIEW

The Craft Instructor Training Scheme is operational since inception of the Craftsmen Training Scheme. The first Craft Instructor Training Institute was established in 1948. Subsequently, 6 more institutes namely, Central Training Institute for Instructors (now called as National Skill Training Institute (NSTI), NSTI at Ludhiana, Kanpur, Howrah, Mumbai, Chennai and Hyderabad were established in 1960 by DGT. Since then the CITS course is successfully running in all the NSTIs across India as well as in DGT affiliated institutes viz. Institutes for Training of Trainers (IToT). This is a competency based course for instructors of one year duration. “Draughtsman Mechanical” CITS trade is applicable for Instructors of “Draughtsman Mechanical” CTS Trade.

The main objective of Crafts Instructor training programme is to enable Instructors explore different aspects of the techniques in pedagogy and transferring of hands-on skills so as to develop a pool of skilled manpower for industries, also leading to their career growth & benefiting society at large. Thus promoting a holistic learning experience where trainee acquires specialized knowledge, skills & develops attitude towards learning & contributing in vocational training ecosystem.

This course also enables the instructors to develop instructional skills for mentoring the trainees, engaging all trainees in learning process and managing effective utilization of resources. It emphasizes on the importance of collaborative learning & innovative ways of doing things. All trainees will be able to understand and interpret the course content in right perspective, so that they are engaged in & empowered by their learning experiences and above all, ensure quality delivery.

2. TRAINING SYSTEM

2.1 GENERAL

CITS courses are delivered in National Skill Training Institutes (NSTIs) & DGT affiliated institutes viz., Institutes for Training of Trainers (IToT). For detailed guidelines regarding admission on CITS, instructions issued by DGT from time to time are to be observed. Further complete admission details are made available on NIMI web portal http://www.nimionlineadmission.in. The course is of one-year duration. It consists of Trade Technology (Professional skills and Professional knowledge), Training Methodology and Engineering Technology/ Soft skills. After successful completion of the training programme, the trainees appear in All India Trade Test for Craft Instructor. The successful trainee is awarded NCIC certificate by DGT.

2.2 COURSE STRUCTURE

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

S No.	Course Element	Notional Training Hours
1.	**Trade Technology**	
	Professional Skill (Trade Practical)	640
	Professional Knowledge (Trade Theory)	240
2.	**Engineering Technology**	
	Workshop Calculation	120
	Workshop Science	80
3.	**Training Methodology**	
	TM Practical	320
	TM Theory	200
	Total	**1600**

2.3 PROGRESSION PATHWAYS

- Can join as an Instructor in a vocational training Institute/ technical Institute.
- Can join as a supervisor in Industries.

2.4 ASSESSMENT & CERTIFICATION

The CITS trainee will be assessed for his/her Instructional skills, knowledge and attitude towards learning throughout the course span and also at the end of the training program.

a) The Continuous Assessment (Internal) during the period of training will be done by **Formative Assessment Method** to test competency of instructor with respect to assessment criteria set against each learning outcomes. The training institute has to maintain an individual trainee portfolio in line with assessment guidelines. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The **Final Assessment** will be in the form of **Summative Assessment Method**. The All India Trade Test for awarding National Craft Instructor Certificate will be conducted by DGT at the end of the year as per the guidelines of DGT. The learning outcome and assessment criteria will be the basis for setting question papers for final assessment**.** The external 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 CRITERIA

Sl. No.	Subject		Marks	Internal assessment	Full Marks	Pass Marks	
						Exam	Internal assessment
1.	Trade Technology	Trade Theory	100	40	140	40	24
2.		Trade Practical	200	60	260	120	36
3.	Engineering Technology	Workshop Calculation	50	25	75	20	15
4.		Workshop Science	50	25	75	20	15
5.	Training Methodology	TM Practical	200	30	230	120	18
6.		TM Theory	100	20	120	40	12
Total Marks			**700**	**200**	**900**	**360**	**120**

The minimum pass percent for Trade Practical, TM practical Examinations and Formative assessment is 60% & for all other subjects is 40%.There will be no Grace marks.

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. While assessing, the major factors to be considered are

approaches to generate solutions to specific problems by involving standard/non-standard practices.

Due consideration should also 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 of the following:

- Demonstration of Instructional Skills (Lesson Plan, Demonstration Plan)
- Record book/daily diary
- Assessment Sheet
- Progress chart
- Video Recording
- Attendance and punctuality
- Viva-voce
- Practical work done/Models
- Assignments
- Project work

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming yearly 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 be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of an ***acceptable standard*** of crafts instructorship with ***occasional*** **guidance** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***fairly good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Average engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A fairly good level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Occasional support in imparting effective training.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of a ***reasonable standard*** of crafts instructorship with	• Demonstration of ***good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Above average in engagement of students for learning and achievement of goals

***little* guidance** and engage students by demonstrating good attributes of a trainer.	while undertaking the training on specific topic. • A good level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Little support in imparting effective training.
(c) Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of a ***high standard*** of crafts instructorship with ***minimal or no support*** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***high*** skill level to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Good engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A high level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Minimal or no support in imparting effective training.

3. GENERAL INFORMATION

Name of the Trade	**Draughtsman Mechanical - CITS**
Trade Code	DGT/4014
Reference NCO 2015	2356.0100, 3118.0401, 3118.0402
NSQF Level	Level-6
Duration of Craft Instructor Training	One Year
Unit Strength (No. Of Student)	25
Entry Qualification	Degree in appropriate branches of Mechanical/ Production Engineering from AICTE/ UGC recognized Engineering College/ University. OR Diploma in appropriate branches of Mechanical/Production Engineering from AICTE/ recognized board / Institution. OR National Trade Certificate in the Draughtsman (Mechanical) trade or related trades. OR National Apprenticeship Certificate in the Draughtsman (Mechanical) or related trades.
Minimum Age	18 years as on first day of academic session.
Space Norms	100 Sq. M
Power Norms	1 KW
Instructors Qualification for	
1. Draughtsman Mechanical - CITS Trade	B.Voc/Degree in appropriate branches of Mechanical / Production Engineering from AICTE/UGC recognized University with two years experience in relevant field. OR 03 years Diploma in appropriate branches of Mechanical / Production Engineering from AICTE/ recognized Board/ Institution or relevant Advanced Diploma (Vocational) from DGT with five years experience in relevant field. OR NTC/ NAC passed in the Draughtsman (Mechanical) trade with seven years experience in relevant field. **<u>Essential Qualification:</u>** National Craft Instructor Certificate (NCIC) in Draughtsman (Mechanical) trade, in any of the variants under DGT.

2. Workshop Calculation & Workshop Science	B.Voc/Degree in any Engineering discipline from AICTE/ UGC recognized Engineering College/ university with two years experience in relevant field. **OR** 03 years Diploma in any Engineering discipline from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with five years experience in relevant field. **OR** NTC/ NAC in any Engineering trade with seven years experience in relevant field. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade OR NCIC in RoDA or any of its variants under DGT
3. Training Methodology	B.Voc/Degree in any discipline from AICTE/ UGC recognized College/ university with two years experience in training/teaching field. OR Diploma in any discipline from recognized board / University with five years experience in training/teaching field. OR NTC/ NAC passed in any trade with seven years experience in training/teaching field. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in any of the variants under DGT / B.Ed /ToT from NITTTR or equivalent.

Distribution of training on Hourly basis: (Indicative only)

Total Hrs /week	Trade Practical	Trade Theory	Workshop Calculation	Workshop Science	TM Practical	TM Theory
40 Hours	16 Hours	6 Hours	3 Hours	2 Hours	8 Hours	5 Hours

4. JOB ROLE

Brief description of job roles:

Manual Training Teacher/Craft Instructor; instructs students in ITIs/Vocational Training Institutes in respective trades as per defined job role. Imparts theoretical instructions for the use of tools & equipments of related trades and related subjects. Demonstrate process and operations related to the trade in the workshop; supervises, assesses and evaluates students in their practical work. Ensures availability & proper functioning of equipment and tools in stores.

Draughtsman-Mechanical; selects the appropriate equipment and drawing software to use based on the type and complexity of the drawing functions to be carried out and the use of a CAD system linked bills of material, file management and associated customization of installed software including the use of macros, menus and default settings.

Draughts person, Mechanical; prepares drawings of machines, plants, mechanical components, equipment, etc. from sketches, notes, data or sample for purposes of manufacture or repairs. Takes instructions from Mechanical Engineer and calculates dimensions as required, from available materials (notes, data etc.) or sample. Draws to scale detailed drawings, assembly drawings, showing plan, elevations, sectional views etc. according to nature of work and operations required. Prints (writes) dimensions, tolerances, material to be used and other details to gives clear picture and facilitate understanding. Maintains copies of drawings and makes blue prints. May trace drawings. May design simple mechanical parts. May prepare estimates for materials and labour required. May specialize in making drawings of jigs and tools and be designated accordingly.

Reference NCO-2015:

a) 2356.0100 - Manual Training Teacher/Craft Instructor
b) 3118.0401 - Draughtsperson, Mechanical
c) 3118.0402 – Draughtsman, Mechanical

5. LEARNING OUTCOMES

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

5.1 TRADE TECHNOLOGY

1. Demonstrate safe working practices, environment regulation, housekeeping and to communicate technical English with required clarity.
2. Demonstrate the basic B.I.S. & International standards, conventional representation of metals.
3. Construct orthographic projection giving proper dimensioning.
4. Illustrate sectional view and development view with dimension.
5. Create& indicate the specification of different types of fasteners as per SP-46:2003.
6. Construct different types of key, cotters joint, pin & construct and types of belts, pulleys, gear and coupling.
7. Demonstrate drawing with tolerance dimension, indicating machining & surface roughness symbol and then evaluate.
8. Illustrate detail & assembly drawing of machine parts, all types of bearing, engine parts, pumps, valves conventional sign & symbol.
9. Prepare drawing of machine parts by measuring with gauges & measuring instrument.
10. Construct types of press tool parts with tolerance dimension & basic knowledge on tools.
11. Demonstrate basic knowledge on tools, equipment & their application in allied trade, Viz. Sheet metal work, Welder (G & E), Fitter, Mechanical motor vehicle, Turner, Machinist.
12. Explain computer application & creation of 2D, 3D object on CAD software, solid molding & surface molding by SOLIDWORK software and assess the output.
13. Demonstrate CNC machines and conduct exercises on overview of programming and operation of CNC.

6. COURSE CONTENT

SYLLABUS - DRAUGHTSMAN MECHANICAL (CITS)			
TRADE TECHNOLOGY			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Practical 16 Hrs Theory 06 Hrs	Demonstrate safe working practices, environment regulation, housekeeping and to communicate technical English with required clarity.	1. Occupational Safety & Health Importance of housekeeping & good shop floor practices. 2. Health, Safety and Environment guidelines, legislations & regulations as applicable. 3. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. 4. Basic safety introduction, Personal protective Equipment(PPE):- 5. Basic injury prevention, Basic first aid, Hazard identification and avoidance, 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. 6. Technical English: Prepare different types of documentation as per industrial need by different methods of recording information. 7. Basic Life support training: 8. Be able to perform DRSABCD: D: Check for Danger R: Check for a Response S: Send for help A: Open the Airway B: Check for normal Breathing C: Perform CPR (Cardio	Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Response to emergencies e.g.; power failure, fire, and system failure Soft Skills: its importance and Job area after completion of training. Introduction to 5S concept & its application. Importance of 5S implementation throughout CITS course-workplace cleaning, machine cleaning, signage, proper storage of equipment etc. Importance of Technical English terms used in industry -(in simple definition only)Technical forms, process charts, activity logs, in required formats of industry, estimation, cycle time, productivity reports, job cards. Basic Life support (BLS):- Basic Life Support (BLS) techniques for drowning, choking, electrocution, neck and spinal injury, including CPR (cardiopulmonary resuscitation).

		Pulmonary Resuscitation) D: Attach Defibrillator / Monitor as soon as available.	
Practical 16 Hrs Theory 06 Hrs	Demonstrate the basic B.I.S. & International standards, conventional representation of metals.	9. Conventional representation and different rule as per SP-46:2003, B.I.S and other International Standards and there equivalent i.e. SP-46:2003, B.I.S, B.S, DIN, JIS, ASTM, AAR. 10. Construct of different types of scales given problem.	Importance of trade in the development of industry. Role of SP-46:2003, B.I.S and International Standards there uses in modern industry. Indian standards and awareness of other International Standards. Importance of scale, size of scale, Representative fraction, The scale on drawing sheets & Types of scale and importance.
Practical 32 Hrs Theory 12 Hrs	Construct orthographic projection giving proper dimensioning.	11. Exercise on Orthographic projection of machine parts & vice-versa. 12. Plan on Dimension techniques and its application.	General principle of projection and their types of isometric, pictorial view. General principles of dimensioning on engineering drawing.
Practical 32 Hrs Theory 12 Hrs	Illustrate sectional view and development view with dimension.	13. Exercise of different types of section, conventional sings, symbols, types of section lines , abbreviation for different materials as per SP- 46 : 2003 and sectioning views practice on different machine parts. 14. Contract of development surface drawing of prisms, cylinder, pyramids, cone and their frustum, 3- pieces pipe elbow, a pipe hole through it, a bucket and a funnel diametric drawing & orthographic projection.	Importance of sectional views, types of sectional views and there uses. Definition of development surface& its need in industry. Different methods of surface development.
Practical 32 Hrs Theory 12 Hrs	Create & indicate the specification of different types of fasteners as per SP-46:2003.	15. Prepare on Screw thread and their representation, types of nuts, bolts and studs, machine screw, cap screw, set screw as per specification, locking devices and foundation bolts 16. Practice of different types of riveted and welded	Types of fasteners and there uses. Screw threads, term of nomenclature. Types of screw thread use, as per SP-46:2003 convention, types of nuts, bolts and studs and their use, different types of machine screw, cap screw, set screw as per specification, different types of locking devices and

		joints.	foundation bolts and their uses. Types of rivets and riveted joint. Description of welding joints and their representation (actual and symbolic) Indication of welding symbols on drawing as per I.S.
Practical 32 Hrs Theory 12 Hrs	Construct different types of key, cotters joint, pin &types of belts, pulleys, gear and coupling.	17. Exercise of Keys, Cotter joint& pin. 18. Prepare on different types of pulleys. 19. Practice of working drawing of coupling and knuckle joint. 20. Construct of gears profile (spur, rack & pinion etc.)	Definition of types of key, cotters & cotters joints. Transmission of power by types of belt, pulleys, gear, chain and coupling.
Practical 16 Hrs Theory 06 Hrs	Demonstrate drawing with tolerance dimension, indicating machining & surface roughness symbol and then evaluate.	21. Demonstration on indication of linear and angular tolerances on technical drawing. 22. Prepare on representation of geometrical and dimensional tolerances on drawing. 23. Practice of different methods of showing surface finish symbol on working drawings. 24. Practice on machining symbols and method of indicating surface texture on technical drawing. 25. Exercise of representation of surface roughness on drawing.	Limits, fits and tolerances, interchange ability and its terms as per IS. Types of geometrical & dimensional tolerance. Machining symbols and Terminology for surface roughness system. Method of indicating surface texture on technical drawing.
Practical 112 Hrs Theory 42 Hrs	Illustrate detail& assembly drawing of machine parts, all types of bearing, engine parts, pumps, valves conventional sign & symbol.	26. Practice of detail & assembly drawings of the components of different machine and machine parts.	Different types detail& assembly drawing. Elements of production drawing.
		27. Exercise of a simple bearing and footstep bearing. Details & assembly drawing of roller and ball bearing including taper roller bearing. 28. Demonstration on Different types of pipe layout, pipe	Types of bearing, difference between plain and anti-frictional bearing. Advantages of anti-frictional bearing over plain bearing. Brief description of different types of pipes and tubes,

		joints, pipe fittings, flange, union etc. Different piping drawing i.e.	purpose of pipe fitting, pressure ratings, joints, their fittings and flanges. Pipe material and specification.
		29. Prepare on assemble drawing of engine parts & construct of cams and followers with different motion.	Boiler mountings and accessories. Different parts of I.C engine and there purposes. Working principle of 2-stroke and 4-stroke engine. Different types of cam and followers used in industry, kinds of motion displacement diagram.
		30. Exercise on assembly drawing of different types of pumps (centrifugal & reciprocating), valves and safety valves	Brief description and function of centrifugal and reciprocating pump. Different types of valves and their function.
		31. Construct of assembly and details of drawing of screw jack.	Brief description working principles and function of screw jack.
		32. Prepare on types drilling jig. 33. Practice of detail drawing of a milling fixture.	Different types of jig and fixture. Section of standard bush. Different locating methods and clamping devices.
Practical 16 Hrs Theory 06 Hrs	Prepare drawing of machine parts by measuring with gauges & measuring instrument.	34. Sketching of different types of gauges such as plug, snap, thread, taper etc.	Function of gauges, different types of gauges and there uses. Use of template in industry.
Practical 32 Hrs Theory 12 Hrs	Construct types of press tool parts with tolerance dimension & basic knowledge on tools.	35. Demonstration of different types of press tool giving nomenclature of each part. 36. Demonstration on with saws, chisels, raps, planes, rules, try-square, scribers and dividers.	Press tool - types, parts and function. Safety precaution, description uses and care of hand tool including construction rule and allowance.
Practical 176 Hrs Theory 66 Hrs	Demonstrate basic knowledge on tools, equipment & their application in allied trade, Viz. Sheet metal work, Welder (G & E), Fitter, Mechanical motor vehicle, Turner, Machinist.	37. Demonstration on hand tools such as hammers, stakes, mallet, punches etc. Development of surfaces from working drawing.	ALLIED TRADE: OVERVIEW SHEET METAL WORK Names and description of common equipment's. Different types and uses of joint employed in sheet metal work.
		38. Demonstration on arc welding and gas welding, welding torch, electrodes,	ALLIED TRADE: OVERVIEW WELDER (G & E) Different types of welding

		filler wires, different types tool used in the trade.	and welding joints and symbols as per BIS. Surface and edge preparation required for welding.
		39. Exercise on fitter related skills. Different types of hand tools, cutting tools and measuring instruments used in marking, preparing & fitting.	ALLIED TRADE: OVERVIEW FITTER: Description and application of simple hand tools, cutting tools and measuring instruments etc.
		40. Identification of different parts of I.C engine. Both spark ignition and compression ignition: 2-stroke & 4-stroke engines.	ALLIED TRADE: OVERVIEW MECH. MOTOR VEHICLE: Brief description of I.C engine and its parts such as cylinder block, piston, connecting rod, cam shaft, carburetor, spark plug, Fuel Injection pump, etc.
		41. Demonstration on plain, step, boring and taper turning, thread cutting.	ALLIED TRADE: OVERVIEW TURNER Lathe - its types, parts, accessories, tools, tool materials and different operations.
		42. Exercise on simple operations on milling and shaping machine.	ALLIED TRADE: OVERVIEW MACHINIST: Description of shaping, planning & milling machines, their parts, accessories and different mechanism and operations.
Practical 80 Hrs Theory 30 Hrs	Explain computer application & creation of 2D, 3D object on CAD software, solid modeling & surface modeling by SOLIDWORK software and assess the output.	**CAD Draw simple figures.** 43. CAD commands and use of different menus and different tool bars. 44. Exercise on editing drawing using different options under modify menu. Creating dimensions of drawing with the help of dimension menu. 45. Demonstration on Layer setup and creating sectional drawing. Familiarization with different options for creating dimensions and adding text to drawing creating drawing in different layers. 46. Creating sectional drawing	PRACTICAL RELATED THEORY Different basic CAD commands (AUTOCAD) and use of different menus and different tool bars.

		using different patterns. Editing objects through properties bar. 47. Construct on orthographic view & sectional view of a steel bracket with dimension using shortcut. 48. Exercise on detail and assembly drawing.	
		49. Demonstration on methods of generating solids and solid editing. Setting up of drawing limits units & scale. 50. Demonstration of 3D modeling with solid modeling software. 51. Demonstration on saving a drawing file in other formats. 52. Exercise on detail& Assembly of simple machine drawing. Creating layout, page setup, selection of plotting devices & plotting a drawings. 53. Industrial cum study tour in different organization having drawing & design office with required facilities	Analyzing the drawing using inquiry option. Creating isometric drawing from orthographic views. Editing properties of the drawing. Making, editing & inserting block under insert menu. Introduction of solid and parametric modelling. Printing and plotting commands. Awareness about design / drawing related latest software.
		54. Demonstration of SOLIDWORKS Graphical user Interface, sketcher, part modelling, assembly modelling, surface modelling, drafting, sheet metal and product data management.	PRACTICAL RELATED THEORY SOLIDWORKS Different basic commands and use of different menus and different tool bars.
Practical 48 Hrs Theory 18 Hrs	Demonstrate CNC machines and conduct exercises on overview of programming and operation of CNC.	55. Demonstrations on CNC machines	Difference between Conventional & CNC machining system. Working principles of CNC machines. Knowledge of part programing.
		56. Exercise on overview of programming & operation of CNC. Concept on MASTER CA.	Introduction to CNC machining system. Advantages of CNC machining system& code of CNC machining system. (G.-code & M. code).

SYLLABUS FOR CORE SKILLS
1. Workshop Calculation & Workshop Science (120Hrs + 80 Hrs)
2. Training Methodology (TM) (Common for all CITS trades) (320 Hrs + 200 Hrs.)

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

7. ASSESSMENT CRITERIA

LEARNING OUTCOME	ASSESSMENT CRITERIA
TRADE TECHNOLOGY	
1. Demonstrate safe working practices, environment regulation, housekeeping and to communicate technical English with required clarity.	Demonstrate the basic knowledge of Personal Protective Equipment (PPE).
	Demonstrate basic life support training method.
	Prepare various documents for industrial requirements using the methods of recording information.
	Explain health, safety and environment guidelines, legislations & regulations.
	Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner.
	Ensure safety procedure as per standard norms.
2. Demonstrate the basic B.I.S. & International standards, conventional representation of metals.	Demonstrate necessary calculation or spacing to drawing sheet dimensions of various components / parts of drawing.
	Demonstrate the Construction of the conventional break viz. Shaft or round bar, pipes, rolled shape, bar of rectangular or square cross- section &wood scantling.
	Illustrate the conventional representation of common features viz. internal thread, external thread, slotted hole, etc based on basic B.I.S & International standards.
	Evaluate creation of different types of section lines and abbreviations of metal, non- metal, liquid etc. in section form as per SP-46:2003.
	Observe safety precautions while working on drawing sheet.
3. Construct orthographic projection giving proper dimensioning.	Illustrate convention of the dimension in required scale to drawing in drawing sheet.
	Interpret drawing requirement such as types of orthographic projection symbol.
	Evaluate drafting principal to produce drawing sheet showing elevations, plans and end views.
	Assess appropriate dimension system rule to draw the required drawing as per the standard practices.
	Check the different types of line uniformly.
	Demonstrate dimension placing system and other reference that follow the required conventions.
	Observe safety norms.
4. Illustrate sectional view and development view with dimension.	Evaluate Sketching of Conventional signs and symbols for section.
	Assess sectional views with adjacent object showing cutting plane and direction of view.
	Demonstrate drafting principal to produce drawing sheet showing sectional elevations, plans and end views.
	Illustrate the development of the surface of cylinder, prisms, cone,

	pyramids and their frustum.
	Check development of an oblique cone with elliptical base.
	Create orthographic projection of interpenetrated cone, cylinder & pyramids intersecting each other.
	Check the drawing as per types of line & place of dimension system as per SP-46:2003.
5. Create& indicate the specification of different types of fasteners as per SP-46:2003.	Construct different Screw threads with SP-46:2003 conventions.
	Create types of bolts, studs, nuts, washers and other fasteners as per SP-46:2003 conventions.
	Illustrate different locking arrangement of nuts, machine screws, caps screw set screw as per convention.
	Assess the foundation bolt viz. eye, rag and Lewis.
	Check dimensioning of rivets and riveted joints with conventional specification.
6. Construct different types of key, cotters joint, pin & construct & types of belts, pulleys, gear and coupling.	Illustrate the keys, cotter joint & pin as per convention.
	Construct tooth profile of a spur gear, rake & pinion gear.
	Create different types of pulleys.
	Demonstrate working drawing of coupling and knuckle joint.
	Check appropriate dimension system rule to draw the required drawing as per the standard practices.
7. Demonstrate drawing with tolerance dimension, indicating machining & surface roughness symbol and then evaluate.	Demonstrate appropriate denotations for continual & details on drawing.
	Demonstrate working drawing dimension within tolerance limit, indicating the machine& surface symbol.
	Ensure that all details for preparation of drawing are available and in order.
	Assess the project sheets as per drawing and maintain for future references.
	Ensure safety precautions while working on drawing sheet.
8. Illustrate detail & assembly drawing of machine parts, all types of bearing, engine parts, pumps, valves conventional sign & symbol.	Evaluate necessary calculation or spacing to drawing sheet dimensions of machine part detail & assembly drawing.
	Demonstrate drafting principal to produce drawing sheet showing sectional elevations plans and different types of views.
	Assess all types of bearing, engine parts, pumps & valves details & assembly drawing.
	Analyse table to denote the name, dimensions, materials, quantity, remarks of various parts or components as per drawing requirement.
	Demonstrate appropriate dimension system rule to draw the required drawing as per the standard practices.
	Check the drawing by different types of line use as per SP-46: 2003.
9. Prepare drawing of machine parts by measuring with gauges &	Assess machine parts according to drawing.
	Demonstrate the tools for measurement by different gauges.
	Choose proper gauge for proper size of job.

measuring instrument.	Apply safety measures as per standard for measuring by gauges.
	Observe safety norms for drawing.
10. Construct types of press tool parts with tolerance dimension & basic knowledge on tools	Demonstrate press tool parts for functional application.
	Make available the functionality hand tools.
	Construct the detail and assembly drawing of different types of press tool part.
	Ensure that all details for preparation of drawing are available and are in order.
	Monitor tolerance dimension placing system and other reference that follow the required conventions.
11. Demonstrate basic knowledge on tools, equipment & their application in allied trade, Viz. Sheet metal work, Welder (G & E), Fitter, Mechanical motor vehicle, Turner, Machinist.	Demonstrate different types of tool , equipment & functional application
	Check functionality of machine.
	Identify different works and tool holding devices for functional application.
	Perform the job as per set standard limits & tolerance.
	Observe safety norms.
12. Explain computer application & creation of 2D, 3D object on CAD software, solid modeling & surface modeling by SOLIDWORK software and assess the output.	Ensure application of advance CAD commands e.g. layers, block, insert, group, divide, measure, design center, text gradient, dimension style, leader, layouts, model space, view ports.
	Generate line segment in AutoCAD importing data from Excel worksheet.
	Explain brief details of AUTOCAD 3D modelling.
	Illustrate simple 3D drawings through AUTOCAD.
	Generate assemble of parts by 3D modelling on AUTOCAD.
	Generate 3 views from 3D models.
	Brief about of details of SOLIDWORKS software.
	Create simple sketcher, part modelling by SOLIDWORKS.
	Illustrate the assembly modelling & surface modelling of SOLIDWORKS software.
	Assess drawing view, sheet metal &produce data management of SOLIDWORKS software.
	Check for relevant and appropriate symbol as per drawing requirement to provide details in the drawings.
13. Demonstrate CNC machines and conduct exercises on overview of programming and operation of CNC.	Demonstrate tools for CNC turning and milling system.
	Explain advantages of CNC turning and milling system.
	Explain classification of CNC turning and milling system.
	Demonstrate part programming& simulation of CNC turning and milling system.

8. INFRASTRUCTURE

LIST OF TOOLS AND EQUIPMENT FOR DRAUGHTSMAN MECHANICAL – CITS TRADE			
(for batch of 25 candidates)			
S No.	**Name of the Tool & Equipment**	**Specification**	**Quantity**
A. Trainees tool kit			
1.	Drawing Instrument Box with accessories.		26 sets
2.	Set square celluloid	45 (250x1.5mm)	26 sets
3.	Set square celluloid	60 (250x1.5mm)	26 sets
4.	French-curves	Set of 20 celluloid	26 sets
5.	Drawing Board	(700 x 500) IS:1444	26 sets
6.	Tee-Square	(700 mm blade) IS:1360	26 sets
7.	Mini Drafter		26 sets
B. General Shop Outfit			
8.	Computer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch. Licensed Operating System and Antivirus compatible with trade related software.	14 nos.
9.	Software: MS-Office 2010 or latest version of operating		14 users Licensed
10.	Software Auto-CAD with power pack or latest version.		14 users
11.	Laser Jet printer Latest model	Print, Copy and Scan 1200x1200dpi, 16MB	1 no.
12.	UPS		As required
13.	Chest of drawers	(8 drawers)	2 nos.
14.	Trainees Locker	(8 drawers)	3 nos.
15.	Book Self		2 nos.
16.	Steel tape	2 meters (Pull type)	1 nos.
17.	Drawing table	A1 sheet	26 nos.
18.	Stools (Revolving type) Adjustable height		26 nos.
19.	T.O's Table	6ftX4ft	1 no.

20.	T.O's Chair Armed chair - Revolving		1 no.
21.	Almirah Steel 6ft. height or higher		2 nos.
22.	Computer table		14 nos.
23.	Computer chairs - Revolving		26 nos.
24.	Table for printers		1 no.
25.	D.L.P Projector	2000 LUMEN OR HIGHER	1 no.
26.	Motorised Screen for Projector		1 no.
27.	White board	6ft. x 4ft.	1 no.
28.	Fire Fighting Equipment		As required
29.	First Aid Box		1 no.
30.	Equipment for conducting BLS (Basic Life Support) training. (Optional)		1 set
C. FURNITURE			
31.	Class Room Chairs (armless) / Dual desk may also be allowed		25 /13 nos.
32.	Class Room Tables	(3ft X 2ft) / Dual desk may also be allowed	25 /13 nos.
33.	Chair for Trainer (armed) movable		1 no.
34.	Table for Trainer	(4 % ft X 2 % ft) with Drawer and cupboard	1 no.
35.	LCD / LED Projector		1 no.
36.	Multimedia Computer System with all accessories with UPS(.5 KVA)		1 set
37.	Computer Table		1 nos.
38.	White Board	(6ft X 4 ft.)	1 no.
39.	LCD Projector Screen		
40.	Air Conditioner		As required
41.	Wall Clock		1 no.
42.	Wall charts, Transparencies and DVDs related to the trade		As required
43.	Laser Printer with scanner		1 no.
44.	Steel Cupboard with 8 pigeon lockers		3 nos.
45.	Work bench for fitters with two vices of 100mm		2 nos.
46.	Steel cupboard	180x90x45cm	2 nos.
47.	Steel cupboard	120x60x45cm	2 nos.
48.	Multi drawer tool rack trolley	with minimum 4 drawers and 20 tool	04 nos.
49.	capacity		
50.	First aid box.		1 no.

ANNEXURE - I

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts and all others who contributed in revising the curriculum. Special acknowledgement is extended by DGT to the expert members who had contributed immensely in this curriculum.

List of Expert members participated for finalizing the course curriculum of Draughtsman Mechanical (CITS) trade.			
S No.	**Name & Designation Sh/Mr/Ms**	**Organization**	**Remarks**
Members of Sector Mentor Council			
1.	A. D. Shahane, Vice-President, (Corporate Trg.)	Larsen & Tourbo Ltd., Mumbai:400001	Chairman
2.	Dr. P.K.Jain, Professor	IIT, Roorkee, Roorkee-247667, Uttarakhand	Member
3.	N. Ramakrishnan, Professor	IIT Gandhinagar, Gujarat-382424	Member
4.	Dr. P.V. Rao, Professor	IIT Delhi, New Delhi-110016	Member
5.	Dr. Debdas Roy, Asstt. Professor	NIFFT, Hatia, Ranchi-834003, Jharkhand	Member
6.	Dr. Anil Kumar Singh, Professor	NIFFT, Hatia, Ranchi-834003, Jharkhand	Member
7.	Dr. P.P. Bandyopadhyay Professor	IIT Kharagpur, Kharagpur-721302, West Bengal	Member
8.	Dr. P.K.Ray, Professor	IIT Kharagpur, Kharagpur-721302, West Bengal	Member
9.	S. S. Maity, MD	Central Tool Room & Training Centre (CTTC), Bhubaneswar	Member
10.	Dr. Ramesh Babu N, Professor	IIT Madras, Chennai	Member
11.	R.K. Sridharan, Manager/HRDC	Bharat Heavy Electricals Ltd, Ranipet, Tamil Nadu	Member
12.	N. Krishna Murthy Principal Scientific Officer	CQA(Heavy Vehicles), DGQA, Chennai, Tamil Nadu	Member
13.	Sunil Khodke Training Manager	Bobst India Pvt. Ltd., Pune	Member
14.	Ajay Dhuri	TATA Motors, Pune	Member
15.	Uday Apte	TATA Motors, Pune	Member
16.	H B Jagadeesh, Sr. Manager	HMT, Bengaluru	Member
17.	K Venugopal Director & COO	NTTF, Peenya, Bengaluru	Member
18.	B.A. Damahe, Principal L&T Institute of Technology	L&T Institute of Technology, Mumbai	Member
19.	Lakshmanan. R Senior Manager	BOSCH Ltd., Bengaluru	Member
20.	R C Agnihotri Principal	Indo- Swiss Training Centre Chandigarh, 160030	Member
Mentor			
21.	Sunil Kumar Gupta (Director)	DGET HQ, New Delhi.	Mentor
Member of Core Group			
22.	N. Nath. (ADT)	CSTARI, Kolkata	Co-ordinator

23.	H.Charles (TO)	NIMI, Chennai.	Member
24.	Sukhdev Singh (JDT)	ATI Kanpur	Team Leader
25.	Ravi Pandey (V.I)	ATI Kanpur	Member
26.	A.K. Nasakar (T.O)	ATI Kolkata	Member
27.	Samir Sarkar (T.O)	ATI Kolkata	Member
28.	J. Ram Eswara Rao (T.O)	RDAT Hyderabad	Member
29.	T.G. Kadam (T.O)	ATI Mumbai	Member
30.	K. Mahendar (DDT)	ATI Chennai	Member
31.	Shrikant S Sonnavane (T.O)	ATI Mumbai	Member
32.	K. Nagasrinivas (DDT)	ATI Hyderabad	Member
33.	G.N. Eswarappa (DDT)	FTI Bangalore	Member
34.	G. Govindan, Sr. Draughtsman	ATI Chennai	Member
35.	M. N. Renukaradhya, Dy. Director/Principal Grade I.,	Govt. ITI, Tumkur Road, Banglore, Karnataka	Member
36.	B.V. Venkatesh Reddy. JTO	Govt. ITI, Tumkur Road, Banglore, Karnataka	Member
37.	N.M. Kajale, Principal,	Govt. ITI Velhe, Distt: Pune, Maharashtra	Member
38.	Subrata Polley, Instructor	ITI Howrah Homes, West Bengal	Member
39.	Vinod Kumar R. Sr. Instructor	Govt.ITI Dhanuvachapuram Trivendrum, Dist., Kerala	Member
40.	M. Anbalagan, B.E., Assistant Training Officer	Govt. ITI Coimbatore, Tamil Nadu	Member
41.	K. Lakshmi Narayanan, T.O.	DET, Tamil Nadu	Member
Other industry representatives			
42.	Venugopal Parvatikar	Skill Sonics, Bangalore	Member
43.	Venkata Dasari	Skill Sonics, Bangalore	Member
44.	Srihari, D	CADEM Tech. Pvt. Ltd., Bengaluru	Member
45.	Dasarathi. G.V.	CADEM Tech. Pvt. Ltd., Bengaluru	Member
46.	L.R.S. Mani	Ohm Shakti Industries, Bengaluru	Member


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