DRAUGHTSMAN CIVIL

NSQF LEVEL- 4.5

SECTOR – CONSTRUCTION

COMPETENCY BASED CURRICULUM

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

सत्यमेव जयते

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 CIVIL

(Engineering Trade)

SECTOR – CONSTRUCTION

(Revised in 2024)

Version 2.1

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Developed By
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1. COURSEOVERVIEW

The Craft Instructor Training Scheme is operational since inception of the Craftsmen Training Scheme. The first Craft Instructors' 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's 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 Civil" CITS trade is applicable for Instructors of "Draughtsman Civil" CTS Trade.

The main objective of Craft 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)	480
	Professional Knowledge (Trade Theory)	270
2.	**Training Methodology**	
	TM Practical	270
	TM Theory	180
	Total	**1200**

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

3	On the Job Training (OJT)/ Group Project	150
4	Optional Course	240

Trainees can also opt for optional courses of 240 hours duration.

2.3 PROGRESSION PATHWAYS

- Can join as an Instructor in 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 DGTat 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

Allotment of Marks among the subjects for Examination:

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 ***little*** **guidance** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Above average engagement of students for learning and achievement of goals 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	• Demonstration of ***high*** skill level to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field.

attainment of a ***high standard*** of crafts instructorship with ***minimal or no support*** and engage students by demonstrating good attributes of a trainer.	• Goode management 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 CIVIL -CITS**
Trade code	DGT/4009
NCO – 2015	2356.0100, 3118.0100, 3118.0200, 3118.0201, 3118.0300, 3118.0301, 3118.0500, 3118.0600
NOS covered	CON/N9401, CON/N9402, CON/N9475, CON/N9476, CON/N9407, CON/N9477, CON/N9478, CON/N9479, CON/N9480, CON/N9481 ASC/N9411
NSQF Level	Level-4.5
Duration of Craft Instructor Training	One Year
Unit Strength (No. Of Student)	25
Entry Qualification	Degree in Civil Engineering from AICTE/ UGC recognized Engineering College / University. OR 03 years Diploma in Civil Engineering after class 10th from AICTE/ recognized board of technical education. OR Ex-serviceman from Indian Armed forces with 15 years of service in related field as per equivalency through DGR. OR 10th Class with 02 Year NTC/ NAC passed in the trade of "Draughtsman (Civil)"
Minimum Age	16 years as on first day of academic session.
Space Norms	100 Sq. m
Power Norms	1 KW
Instructor's Qualification for	
1. Draughtsman Civil - CITS Trade	B.Voc/Degree in appropriate branches of Civil Engineering from AICTE/UGC recognized University with two years experience in relevant field. **OR** 03 years Diploma in appropriate branches of Civil Engineering from AICTE/ recognized Board/ University with five years experience in relevant field. **OR** Ex-serviceman from Indian Armed forces with 15 years of service in related field as per equivalency through DGR. Candidate should have

	undergone methods of instruct ion course or minimum 02 years of experience in technical training institute of Indian Armed forces. **OR** NTC/ NAC passed in the Draughtsman (Civil) trade with seven years experience in relevant field. Essential Qualification: National Craft Instructor Certificate (NCIC) in Draughtsman (Civil) 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 the related 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.

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 Architectural; Prepares drawings of buildings, parks, gardens, monuments etc. from sketches, designs or data for construction. Studies notes, sketches and other engineering data of buildings, parks, gardens, monuments, etc. to be constructed. Draws sketches of required construction according to directions of Architect to suit purpose and environment; alters them if directed and get them approved by him. Draws to scale drawings according to approved sketches showing plan, elevations, settings, arrangements etc. as necessary. May trace drawing and make blue prints. May prepare architectural designs, may prepare estimate schedules for material and labour. May prepare perspectives designs and render them in colour of monochrome. May prepare model of constructions work.

Draughtsman, Civil; prepares drawings of buildings, stores, high ways, dams, culverts, etc. from sketches, notes or data for purposes of construction or alternations. Takes instructions form Civil Engineer studies sketches and calculates dimensions from notes or data. Draws to given scale different elevations, plan, sectional views etc. of desired construction using drawing instruments. Draws detailed drawings of specific portions as required. Indicates types of materials to be used, artistic and structural features, etc. in drawing as necessary. May do tracing and blue printing. May reduce or enlarge drawings. May prepare or check estimate schedules for cost of materials and labour. May prepare tender schedules and draft agreements.

Plumbing Draftsman; is responsible for preparation of drawings of related to plumbing projects as per instructions.

Draughtsman, Electrical; prepares drawings, diagrams of wirings of buildings, factories, high tension and low tension lines, appliances, motors, generators and other electrical equipment and goods from sketches, designs, data or sample for purposes of manufacture, installation, operation or repairs. Receives instructions from appropriate authority and studies design, sketches, notes, data etc. Draws to scale wiring diagrams, assembly arrangement and other drawings showing electrical connections fittings, sectional view etc. as required. Paints (writes) necessary instructions on drawing such as number of wire, type of insulation etc. to clearly indicate required details. May calculate details from available information by application of standard formulae. May trace and prepare blue prints. May prepare plans of electrical lifts. May prepare estimates, tender schedules and draft agreements.

Draftsman; is also called, 'Design Developer', the Draftsman makes/modifies electrical system drawings of control panels with application in various sectors. The individual at work develops electrical system drawings based on panel requirements of the customer, as communicated

by the Design Engineer. This drawing is then verified by the Design Engineer and used by the production team in order to assemble the control panel.

Draughtsman, Structural; prepares drawings of bridges, steel structures, roof tresses etc. From sketches, designs or data for purposes of construction, alteration or repairs. Studies sketches, data, notes etc. and receives instructions from Structural or Mechanical Engineers regarding details and types of drawings to be made. Calculates dimensions as necessary from available notes, data etc. and by application of standard formulae. Draws to scale detail, assembly and arrangement drawings showing sectional plan and other views as directed and prints (writes) necessary instructions regarding materials to be used, limits, assembly etc. to clearly indicate all aspects of structure to be manufactured. May prepare estimate and operation schedules for labour and material costs. May prepare tender schedule and draft agreements. May prepare tables showing requirements of bars, their numbers, sizes and shapes. May trace and make blue prints.

Draughtsman, Topographical; Sketches topographical drawings to scale in different colours using blue print prepared from field plane tables. Carries out independently projection of small scale map to predetermined size, incorporating features covered in survey, producing total geographical effect by hill shading, giving contours, profile, cross sections, authorized symbols, etc. Uses grid tables, projection table compasses, pantograph, planimeter, etc.

Reference NCO:

a) 2356.0100-Manual Training Teacher/Craft Instructor
b) 3118.0100 –Draughtsman Architectural
c) 3118.0200- Draughtsman, Civil
d) 3118.0201 - Plumbing Draftsman
e) 3118.0300- Draughtsman, Electrical
f) 3118.0301–Draughtsman
g) 3118.0500 - Draughtsman, Structural
h) 3118.0600 - Draughtsman, Topographical

Reference NOS:

a) CON/N9401
b) CON/N9402
c) CON/N9475
d) CON/N9476
e) CON/N9407
f) CON/N9477
g) CON/N9478
h) CON/N9479
i) CON/N9480
j) CON/N9481
k) ASC/N9411

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.

5.1TRADE TECHNOLOGY

1. Demonstrate principles of representation and construction of orthographic projection giving proper dimensioning. (NOS: CON/N9401)
2. Explain sequence of construction various brick/stone Masonry, Composite Masonry & scaffolding in detail. (NOS: CON/N9402)
3. Demonstrate the constructional features of foundations, carpentry joints of doors & windows, stairs, plastering, flooring, painting etc. (NOS: CON/N9475)
4. Assess surveying & levelling of structure as per required specification. (CON/N9476)
5. Evaluate computer application of CAD and Architectural Design software for creating dimensions of solid surface. (NOS: CON/N9407)
6. Demonstrate the principle of representation of a building in drawing paper showing its section, plan elevation. (NOS:CON/N9477)
7. Illustrate detail drawing of Electrical layout of domestic and industrial buildings. (NOS: CON/N9478)
8. Demonstrate the principle of representation and diagrams of roads and railway tracks in drawing paper showing all the necessary parts. (NOS: CON/N9479)
9. Evaluate detail drawings of Culverts, Bridges, Storage &Reservoirs, irrigation structures etc as per specifications. (NOS: CON/N9480)
10. Evaluate computer application of Architectural Desktop software for advanced project work viz. remote sensing application in civil engineering, Photogrammetry, Arial photography etc. (NOS: CON/N9481)
11. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: ASC/N9411)

6. COURSE CONTENT

SYLLABUS FOR DRAUGHTSMAN CIVIL – CITSTRADE			
TRADE TECHNOLOGY			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Practical 35 Hrs. Theory 10 Hrs.	Demonstrate principles of representation and construction of orthographic projection giving proper dimensioning.	**Trade Orientation:-** 1. Construction of ordinary scale, plain, Diagonal, Vernier, Comparative and scale of chords. 2. Orthographic, Isometric and Oblique projections, Dimensioning as per IS. 3. Section and Surface developments of Solids.	Principles of representation and construction of different types of scale, recommended scale for drawing with reference to IS Codes. Familiarization of various Building Materials: Bricks, Cement, Lime, Sand, Stone, Steel, Concrete etc. a) Bricks:-Manufacturing of bricks, Types of Bricks, Characteristics of good bricks, Tiles, Terracotta, Stone Ware and Earthen ware. b) Cement: - Manufacturing, Types, Test of good cement. c) Lime: - manufacturing, Types. d) Timber:- Structure, Disease and Defects of Timber, Seasoning, Preservation and utility. e) Alternate materials to timber: Plywood, Block board, particle board, fireproof reinforced plastic(FRP) and MDF etc.
Practical 35 Hrs. Theory 10 Hrs.	Explain sequence of construction various Brick/stone Masonry, Composite Masonry & scaffolding in detail.	**Stone Masonry & Flooring :-** 4. Demonstrate Brick bonding Different types of Bond, arrangement of bricks in different layers as	Sequence of construction of building, Different parts of building Masonry work:- Types of masonry

		per thickness of wall, piers, coping etc. 5. Explain Stone Masonry- Different types including Stone Joints, Composite Masonry. 6. Explain Flooring- Different types. 7. Explain Types of shoring and Scaffolding in details.	a) Brick Masonry- Principles of construction of bond. Tools and equipment used, Scaffolding. b) Stone Masonry-Terms used, Principles of construction, Classification, Composite Masonry and Strength of masonry.
Practical 75 Hrs. Theory 30 Hrs.	Demonstrate the constructional features of foundations, carpentry joints of doors &windows, stairs, plastering, flooring, painting etc.	**Foundations :-** 8. Explain Types of foundations- different types, piles and its types, Footing Grillages, Raft & Well Foundations. 9. Explain D.P.C:- in different places including plinth protection.	Foundation- Purpose, classification of soil, Concept of Different Types of load, Causes of failure of foundation and its remedies, Bearing capacity of soil, dead load and live loads and seismic loads, Types of foundation. Setting out of building on ground excavation, shoring, simple machine foundation etc. D.P.C-Dampness in building and damp proof course/Materials. Method of prevention of dampness in building. Mortar:-Types, proportion and mixing plastering and pointing. Paints and varnishes:-various types and application, including latest types.
		Flooring :- 10. Demonstrate details of upper floors - wooden floors, stone floors, brick floor and others. 11. Explain Forms arches, lintel and centering. 12. Explain Carpentry joints - Different types.	Ground Floor- types, method of construction and their uses Arches- Technical Terms, Types of Arches. Forms - brick, stone and concrete Lintel - types and materials used Centering, Bending and binding of reinforcement.

		Doors & Windows :- 13. Explain Doors - Different types, Window - Different types. 14. Demonstrate Pitched roof - details of Pitched roof, Roof covering types, King post &Queen Post Truss with joints. 15. Explain Carpentry joints - terms and classification of joints.	Doors, Windows and ventilators - types, materials, location, size. Fixtures and fastenings used in door, window and ventilators. Roof- types of roofs, roof Covering (including water-proofing) - and components of a roof. Types of roof trusses: King Post & Queen Post etc. Classification and construction of upper flooring, General principles of construction of masonry & R.C.C. Carpentry joints - terms and classification of joints.
		Stairs :- 16. Explain Stairs - Brick, Stone, Wooden, & steel and R.C.C - .	Stair - Terms, Forms, Materials, Planning and Designing of stair and Details of construction.
Practical 60 Hrs. Theory 30 Hrs.	Assess surveying & leveling of structure as per required specification.	**Surveying & Levelling :-** 17. Survey Practical (Field Work) a) Chain Triangulation. b) Chain Traverse with Prismatic compass. c) Plane Table Survey. 18. Assess Levelling - Road Project. a) Theodolite Traverse-Taking b) Reading of Vertical &Horizontal Angles. c) Plotting- Plotting and Mapping the Data collected from the above field work.	Surveying - Chain Surveying principle, Instruments employed, use, care & maintenance, field problems, entry of field book, plotting etc. Introduction to plane table survey, Instruments used; care & maintenance, field problems etc. Prismatic Compass - Traversing with compass, Instruments used, Care and adjustment of instruments, field problems. Levelling - Instrument and accessories their uses, Description of Level Book and their entry. R.L calculation by H.I method & Rise fall method.

			Differential Levelling. Application of chain and levelling to building Construction. Plotting, Preparation of contour computing earth works by spot level and contours. Setting out work. Theodolite Traversing for measuring Horizontal & Vertical angles.
Practical 60 Hrs. Theory 30 Hrs.	Evaluate computer application of CAD and Architectural Design software for creating dimensions of solid surface.	**CAD :-** 19. Evaluate Installation of CAD software. 20. Explain Elementary Command of CAD software, Project work in Auto CAD. 21. Explain Commands used in Architectural Design Desktop Software.	Commands of CAD software and their uses. Preliminary Concept of Architectural Design Desktop Software presently used.
Practical 30 Hrs. Theory 15 Hrs.	Demonstrate the principle of representation of a building in drawing paper showing its section, plan elevation.	**Building Drawing :-** 22. Demonstrate drawing details of single storied residential building. Drawing plan, elevation, section, with aid of line diagrams. Layout and detailing of a residential building. 23. Demonstrate drawing details of double storied residential building. Drawing plan, elevation, section, with aid of line diagrams. Layout and detailing of a residential building. 24. Explain drawing Details of RCC members, Rectangular beams, Lintel, chajja, Slab,	Residential Building, principles of planning & orientation. Local building bye laws as including IS code, types of residential building, industrial and public buildings, services, utilities which constitute dwelling and public building. Concept of Multi-storied building

		Stair including column with footing and continuous column showing different position of reinforcement, preparing bar bending schedule.	
Practical 35 Hrs. Theory 10 Hrs.	Illustrate detail drawing of Electrical layout of domestic and industrial buildings.	**Electrical Layout :-** 25. Explain Concept of electric layout. 26. Illustrate wiring in different system, fixing and connecting appliances for domestic lighting.	Estimate: method and find out quantities of materials for residential and public building- estimate for wood and reinforcement for the above construction.
Practical 35 Hrs. Theory 10 Hrs.	Demonstrate the principle of representation and diagrams of roads and railway tracks in drawing paper showing all the necessary parts.	**Roads & Railways :-** 27. DemonstrateCross-section showing the different type of roads. 28. Demonstratedrawing of typical cross-section of railway track, embankment, lay out plans of railway platforms.	Introduction to roads. General principles of alignment, classification and construction of different types of roads (as per I.R.C. classifications). Indian railways their gauges construction of permanent way, different rail section, use of stone ballast in railway track, use and types of sleepers including fishplate and base plate in railway.
Practical 75 Hrs. Theory 30 Hrs.	Evaluate detail drawings of Culverts, Bridges, Storage &Reservoirs, irrigation structures etc as per specifications.	**Bridges : -** 29. Assess drawing details: a) Preparing drawing of a masonry culvert and take out various quantities of items of work and prepare abstract of cost. b) Types of rivets and riveted joints. c) Types of standards steel sections and built up section used for Girders and Stanchion.	Bridge - Introduction to Culverts &Bridges, Component parts of culvert &bridge, Classification of culverts & Bridge. Location of bridge. Tunnels, Rules used for sizes of different members. Take out various quantities of items of work and prepare abstract of cost. Introduction on water resource engineering : definition of terms used in irrigation & hydrology like- duty, delta, intensity of

		d) Arched bridge.	irrigation, Hydrograph , peak flow, Run off, Catchment area - CCA, rabi, Kharif etc.
		Storage, Reservoirs & Irrigations :- 30. Assess drawing details: a) Preparation of drawing of retaining wall, dam etc. b) Drawing of different types of irrigation structure viz - Retaining Walls, Dams, Barrages, Weir etc. with the help of given sketch & data. Longitudinal section of distributaries at different river diversion, types of outlets and regulators.	Canals- classification of canal and distribution system, canal structure viz head regulator, canal outlet, escape etc. Types of cross drainage works viz Aqueduct, Syphon Aqueduct, Super passage, Syphon , Super passage , Level crossing , irrigation culverts, inlets and outlets. Storage/ Diversion head works. Definition and types of Dams Reservoir - types of reservoirs. Concepts of element of water power Development and various civil engineering structure of hydro-electric scheme i.e. forbay, Penstock, turbines, Power house etc.
		Public health engineering 31. Preparation of Drawing showing various pipe joints for underground drainage, Method of sanitary fittings in multi-storied buildings, Manholes & Septic tank. 32. Explain Layout of drainage and sewage system, water supply system of building. 33. Demonstrate Rain water harvesting and recharging.	Terms used in public health engineering, system of sanitation-house plumbing, Manholes & Septic tank, sanitary fittings etc.
Practical 40 Hrs. Theory 20 Hrs.	Evaluate computer application of Architectural Desktop software for advanced project work	**Civil Engineering Drawing** 34. Evaluate civil engineering drawing using Architectural Desktop software. Project work by	Concept of civil engineering drawing using Architectural Desktop Software. Introduction to remote sensing application in civil engineering.

	viz.remote sensing application in civil engineering, Photogrammetry, Arial photography etc.	advanced desktop software.	Ideal remote sensing system, atmospheric windows, ranges of sensing system, spectral signature, types of sensors. Basic principle of Photo grammetry, Arial photography, interpretation , various application like water resources, terrain, evolution, forestry, agriculture, land use, visual interpretation, ground water verification, radio meter. Multispectral, multi temporal, multistage concept, state lite images, FCC, digital image processing, image restoration, image enhancement, false color imagery. Pattern recognition and digital signal processing, basic introduction, Band interleave method, clustering analysis, statistical techniques.
WORKSHOP CALCULATION & SCIENCE: 75 Hrs.			
Professional Knowledge WCS- 75 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**WORKSHOP CALCULATION** Concept of Fraction, Numbers, Variable, Constant, percentage, ratio proportion. Fundamental Algebraic formulae for multiplication and factorization. Algebraic equations, simple & simultaneous equations, quadratic equations and their applications. Concept on progressions. Mensuration: - Concept on basic geometrical definitions, basic geometrical theorems. Determination of areas, perimeters of triangles, quadrilaterals, polygons, circle, sector etc. Areas of irregular shaped surfaces. Simpson's rule, trapezoidal rule, applications. Determination of volumes ,surface areas of cylinders, prisms, pyramids cone spheres, frustums, Volume estimate related to civil work. Calculation related to swept volume, clearance volume. Trigonometry: Ratios, tables, degree, grade and radian. Calculation of height and distance with the help of trigonometric formulae.	

		Application of trigonometry in determining the areas of polygons and solution of triangle. Trigonometric ratios of compound, multiple and sub-multiple angle and their uses. Related problems on stress, strain, factor of safety, torsion strength of different shafts. Determination of CG, MI of different solid sections. Problems on power transmission of shaft. Calculations involving Shear Force and Bending Moments diagrams of simply supported beams, cantilevers with point load and uniformly distributed load. Calculation of machining time for different turning, shaping, drilling, milling, grinding, etc. Graphs: basic concept, importance. Plotting of graphs of simple linear equation. Related problems on ohm's law, series-parallel combination. Statistics: Frequency tables, normal distribution, measure of central tendency – Mean, Median & Mode. Concept of probability. Charts like pie chart, bar chart, line diagram, Histogram and frequency polygon. **WORKSHOP SCIENCE** Fundamental units, Scalar & Vector quantity. Difference system of units: F.P.S., C.G.S., M.K.S & S.I. Multiplication factors such as giga, mega, kilo, milli, micro etc. interrelation, calculation and applications. Dimensioning of physical quantities (MLT). **Engineering Materials:** – Classification properties and uses of ferrous metals, non-ferrous metals, alloys etc. Properties and uses of non-metals such as wood, plastic, rubber, ceramics industrial adhesives. **Heat & Temperature**: - Concepts, differences, effects of heat, different units, relation, specific heat, thermal capacity, latent heat, water equivalent, mechanical equivalent of heat. Different Temperature measuring scales and their relation. Transference of heat, conduction, convection and radiation. Thermal Expansion related calculations. **Force and Motion**: - Newton's laws of motion, displacement, velocity, acceleration, retardation, rest & motion such as linear, angular. Force – units, different laws for composition and resolution of forces. Concept on centre of gravity and equilibrium of forces in plane.

		Concept of moment of inertia and torque. **Work, power & energy**: – Definitions, units, calculation & application. Concept of HP, IHP, BHP and FHP – related calculations with mechanical efficiency. S.I. unit of power and their relations. Vector representation of work. **Friction: -** Definitions, effects of friction, Laws of static & dynamic friction, types of friction problems on horizontal and inclined applied forces. Angle of repose. Bodies on rough inclined plane: Explanation and related problems. Introduction on corrosion, causes and prevention. Lubrication process: Types of Lubricants, etc. **Stress & Strain: -** Concepts of stress, strain, modulus of elasticity. Stress- strain curve. Hook's law, different module of elasticity like Young's modulus, modulus of rigidity, bulk modulus and their relations. Poisson's ratio. Principle of super position, stresses in varying cross-sections stress in composite bars. **Simple machines: -** Concept of Mechanical Advantage, Velocity Ratio, Efficiency and their relations. Working principles of inclined plane, lever, screw jack, wheel and axle, differential wheel and axle, worm and worm wheel, rack and pinion. Gear train. **Heat Treatment: -** Introduction, different methods of Heat Treatment and their purposes. Iron-carbon diagram and **T**ime-**T**emperature-**T**ransformation (TTT) diagram. **Electricity:-** Basic definitions like emf, current, resistance, potential difference, etc. Uses of electricity. Difference between ac and dc. Safety devices. Difference between conductors and semiconductors and resistors, Materials used for conductors, semiconductors and resistors. Ohm's Law. Series, parallel and series-parallel combination of resistances. Concept, definitions and units of electrical work, power and energy with related problems.

SYLLABUS FOR CORE SKILLS
1. Training Methodology (Common for all trades) (270 Hrs + 180 Hrs)

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

7. ASSESSMENT CRITERIA

LEARNING OUTCOME	ASSESSMENT CRITERIA
TRADE TECHNOLOGY (TT)	
1. Demonstrate Principles of representation and construction of orthographic projection giving proper dimensioning. (NOS: CON/N9401)	Demonstrate the trade orientation in detail.
	Illustrate convention of the dimension in required scale to drawing in drawing sheet.
	Interpret drawing requirement such as types of orthographic projection symbol.
	Demonstrate drafting principal to produce drawing sheet showing elevations, plans and side 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.
2. Explain sequence of construction various brick/stone Masonry, Composite Masonry & scaffolding in detail. (NOS: CON/N9402)	Explain the list of parameters to be tested in stone and brick Masonry.
	Demonstrate the necessary tools and equipment for the construction and test.
	Illustrate the method of construction and testing including the necessary parameters in scaffolding work.
	Explain the difference between Brick/Stone masonry and composite masonry.
3. Demonstrate the constructional features of foundations, carpentry joints of doors & windows, stairs, plastering, flooring, painting etc. (NOS: CON/N9475)	Demonstrate the constructional features of Foundations.
	Illustrate different types of load and bearing capacity of a soil.
	Explain the construction methodology for lintel, arches, etc.
	Identify the tools required for carpentry joints of doors and windows.
	Explain the material required and construction methodology for different types of flooring.
	Demonstrate the constructional features of stairs.
	List the remedies to be applied for the defects.
	Illustrate the conventional representation of common features.
	Observe safety precautions while working on drawing sheet.
4. Assess surveying & levelling of structure as per required specification. (NOS: CON/N9476)	Illustrate the instruments used for angle measurement.
	Evaluate levelling process using Levelling Instrument/ Theodolite.
	Identify the problems occurred during measurement
	Demonstrate the steps for solution of the measurement

	problems
	Ensure safety norms during the process.
5. Evaluate computer application of CAD and Architectural Design software for creating dimensions of solid surface. (NOS: CON/N9407)	Evaluate selection of appropriate version of CAD and Architectural Design software.
	Determine Ram and Hard disc size for installation in PC.
	List the elementary command in CAD.
	Demonstrate sample drawing by CAD and ADD software.
6. Demonstrate the principle of representation of a building in drawing paper showing its section, plan elevation. (NOS: CON/N9477)	Demonstrate representative fraction for a single storied building diagram.
	Explain the representation of essential parts of a building.
	Develop a sectional view of a multi storied building.
	Give dimension on plan, elevation & section of the building as per IS.
	Evaluate detail drawing of RCC members, Lintel, chajja, Slab etc.
	Demonstrate different tools and equipment used for water supply system of a building.
	Evaluate dimensions of buildings.
	Explain the symbols representing structural members in a drawing.
	Evaluate the dimensions of the drawings as per standard specification.
7. Illustrate detail drawing of Electrical layout of domestic and industrial buildings. (NOS: CON/N9478)	Explain the parameters to be checked in an electrical line.
	List the necessary tools and equipment for testing.
	Demonstrate dimension of electrical layout done in residential buildings as per IS.
	Demonstrate dimension of electrical layout done in industrial buildings as per IS.
	Provide accurate estimate for the quantities of materials required.
8. Demonstrate the principle of representation and diagrams of roads and railway tracks in drawing paper showing all the necessary parts. (NOS: CON/N9479)	Demonstrate cross sections relevant to different roads.
	Develop a typical cross section of a railway track.
	Develop a plan for a railway platform.
	Provide an estimate of the cost required for reinforcement.
9. Evaluate detail drawings of Culverts, bridges, Storage &Reservoirs, irrigation structures etc as per specifications. (NOS: CON/N9480)	Prepare a drawing of a masonry culvert.
	Develop drawing of standard steel sections for construction of bridges.
	Evaluate detail drawing of riveted joints.
	Assess drawing of pipe joints for underground drainage.
	List the sanitary fittings for a multi storied building.

	Evaluate detail drawing of RCC members, Lintel, chajja, Slab etc. for storage and reservoirs.
	Develop a longitudinal sectional drawing of distributaries.
	Demonstrate different tools and equipment used for water supply system of a building.
	Evaluate dimensions of public buildings viz. Hospital, high school, cinema/ theater/super market etc.
	Explain the symbols representing structural members in a drawing.
	Evaluate the dimensions of the drawings as per standard specification.
10. Evaluate computer application of Architectural Desktop software for advanced project work viz. remote sensing application in civil engineering, Photogrammetry, Arial photography etc. (NOS: CON/N9481)	Explain the main features of Architectural Design software.
	Develop a paper drawing in Architectural Design software
	Create sample drawing using commands in Architectural Design software.
	Demonstrate remote sensing application in Civil Engineering.
	Demonstrate translating a mid-map into a rule set.
11. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: ASC/N9411)	Solve different mathematical problems
	Explain concept of basic science related to the field of study

8. INFRASTRUCTURE

LIST OF TOOLS AND EQUIPMENT FOR DRAUGHTSMAN CIVIL (CITS)			
DRAUGHTSMAN CIVIL (For the batch of 25 Candidate)			
S No.	**Name of the Tool &Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Box drawing instrument	Containing one 15 cm compass with pin point, pin point & lengthening bar, one pair spring bows, rotating compass with interchangeable ink and pencil points, drawing pens with plain point & cross point, screw driver and box of leads.	25+1 Sets.
2.	Protractor	Celluloid 15 cm semi- circular	25+1Sets
3.	Scale card board	Metric set of eight A to H in a box 1: 1, 1:2, 1:2:5, 1: 5, 1:10, 1:20, 1:50, 1:100,1:200, 1:500, 1:1000, 1:2000,1:1250, 1:6000, 1:38 1/3, 1:66 2/3	25+1 Sets
4.	Scales plotting box	Wood 6 metric scales 30 cms long with offset scales	25+1 Sets
5.	Scale -Metric and section	Wooden 30 cm long marked with eight scales -1:1, 1:2, 1:2:5, 1:10, 1:20, 1:50, 1:100, 1:5.	25+1 Sets
6.	Set square	Transparent 2 mm thick with bevelled edges 45 degree 20 cm.	25+1 Sets
7.	Set square	Celluloid 2mm thick with bevelled edges 60 degrees25cm.	25+1 Sets
8.	Board drawing	1250 mmX900mm	25+1 Sets
9.	Square T	1250mm/Mini drafter	25+1 Sets
B. GENERAL SHOP OUTFIT			
10.	Geometrical Models (wooden) as per given below :		
a)	Cube	08 cm sides	2 Nos.
b)	Rectangular parallel piped	8cm X 15cm	2 Nos.
c)	Sphere	8 Cm. Dia	2 Nos
d)	Right Circular Cone	8 cm dia base and 15 cm Vertical height	2 Nos.
e)	Square Pyramid	8 cm side base and 15 cm Vertical height	2 Nos.
f)	Cylinder	8 cm dia and 15 cm height	2 Nos.
g)	Prism Triangular	8 cm side triangle and 15 cm length	2 Nos.
h)	Prism Hexagonal	8 cm side's hexagon and 15 cm lengths	2 Nos.
11.	French curves	Transparent plastic set of 12	4 Nos.
12.	Flexible curves	80 cm long	8 Nos.

13.	Elliptic trammel	With ink and pencil for not less than 10 cm minor axis complete in a case.	1 No.
14.	Radius curve metric	3 mm to 15 mm	4 Nos.
15.	Brass parallel rulers in a case.		4 Nos.
16.	Calculator	Scientific	2 Nos.
17.	Planimeter	Sliding bar pattern 70 cm complete in case with magnifier and instructions reading in metric units.	1 No.
18.	Beam compass	With fine adjustments with ink and pencil points and two chromium plated weights 30 cm in wooden case.	2 No.s
19.	Proportional Dividers	15 Cm	4 No.s
20.	Desktop 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.	13 nos.
	a)CAD Software		For 13 user.
	b)Plotter	A0 Size	1 No.
	c)Printer	(Desk jet/ Leaser jet)	1 No.
21.	Laptop	With Latest Configuration	1 No.
22.	Almirah	Steels (Major) 6’ / Higher	2 Nos.
23.	Chest of drawers	8 drawers (standard)	4 Nos.
24.	Draughtsman table		25 Nos.
25.	Draughtsman stool	Revolving	25 Nos.
26.	Training Officer's table	Big size full secretariat 6ft. x 4ft.	1 No.
27.	Chair for Training Officer		1 No.
28.	Architectural Desktop Software	Latest	5 Nos.
29.	Server work station	Latest Configuration	1 No.
30.	Broad Band connection		
31.	UPS		As required
32.	Computer Table		13 Nos.
33.	Computer Chair		21 Nos.
34.	Furniture for server, printer plotter		1 No. Each
35.	White Board	(6’ X 4’)	1 No.
36.	DLP Projector	(2000 lumens or higher	1 No.
37.	First aid box		

C. SURVEY INSTRUMENTS			
38.	Land measuring chains	30 Meters	4 Nos.
39.	Steel Tape	30 Meters Long	2 Nos.
40.	Ranging Rods	Wooden Fitted	19 Nos.
41.	Optical Square	PWD Pattern	4 Nos.
42.	Optical Square	Box Type Circular	1 No.
43.	Dumpy Level Builder	25 cm local length X 23 mm complete with box and accessories and stand.	2 Nos.
44.	Levelling staffs	4 metres reading to 5 mm telescopic type.	1 Telescopic
45.	Plain table	With stands and accessories - Alidade, trough compass, sprit level 6'', U -forks and Plumb-bob etc. (1 set with Telescope alidade)	2 Sets
46.	Prismatic compass with stands.		2 Nos.
D. LIST OF TOOLS FOR ALLIED TRADE USED IN CONSTRUCTION WORK ETC.			
47.	Shovel		2 Nos.
48.	Pan	M.S, 25 Cm dia	6 Nos.
49.	Farma	Wooden for measuring aggregates	1 No.
50.	Bucket	G.I, 35 cm dia	4 Nos.
51.	Masons Plumb Rule.	With Spirit Level	4 Nos.
52.	Masons Square	30 cm X 30 cm	4 Nos.
53.	Sieve for sand	1 mm / 100 X 60 cm	1 No.
54.	Trowel	25 cm X 10 cm	4 Nos.
55.	Sieve for sand	22 mm / 100 X 60 cm	1 No.
56.	Tool Caulking Set	CB 6	2 Sets
57.	Brick Hammer	With Handle	4 Nos.
58.	Rule Fold	Wooden 60 cm	4 Nos.
59.	Painting Trowel	15 cm	4 Pair Each
60.	Motor Board		4 Nos.
61.	Wire Brush		4 Nos.
62.	Wooden Float		4 Nos.
63.	Steel Float		4 Nos.
64.	Spirit Level	30 cm	4 Nos.
65.	Chisel	5 cm hammer head	4 Nos.
66.	Bolster		4 Nos.

67.	Claw Hammer		4 Nos.
68.	Spade		4 Nos.
69.	Measuring Tape	Steel 30 meters	4 Nos.
70.	Ladder	Aluminum 3 meters	4 Nos.
71.	Pickaxe		2 Nos.
72.	Hammer	250 Gms	1 Nos.
73.	Crow Bar	3 cm dia, 1.5 lag	2 Nos.
74.	Hand Hammers	1 Kg	2 Nos.
75.	Binoculars		2 Nos.
76.	Surveyors Umbrella		2 Nos.
77.	Light Tracing Board	Fitted with Glass and framed and lamp	2 Nos.


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