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

COMPETENCY BASED CURRICULUM

CIVIL ENGINEERING ASSISTANT

(Duraiton: Two Years)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 5

SECTOR – CONSTRUCTION

Directorate General of Training

CIVIL ENGINEERING ASSISTANT

(Engineering Trade)

(Revised in 2019)

Version: 1.2

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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1. COURSE INFORMATION

During the two-years duration, a candidate is trained on subjects viz. Professional Skill, Professional Knowledge, Workshop Science & Calculation and Employability Skills related to job role. In addition to this a candidate is entrusted to make/do project work and Extra Curricular Activities to build up confidence. The practical skills are imparted in simple to complex manner & simultaneously theory subject is taught in the same fashion to apply cognitive knowledge while executing task. The practical part starts with simple geometrical drawing and finally ends with preparing sanction plan of Residential / Public building including Architecture & Structural drawing, preparation of map Site Plan, use of different survey instrument, Preparation of Sanitary & Plumbing Layout, detail estimation and costing, bill of materials, BBS of different RCC structures, different maintenance of civil works, Project management of site at the end of the course. The broad components covered under Professional Skill subject are as below:

FIRST YEAR: The practical part starts with basic drawing (consisting of geometrical figure, symbols & representations). Later the drawing skills imparted are drawing of different scales, projections, drawing of convertions of three views from pictorial views, section drawing of single storied building main wall. Practical training imparted to Identify different building materials, Marking excavation lines & fixing of plinth & floor levels. Setting out foundation trench, Performing brick masonry, plastering, damp proofing, flooring, arches / lintel, stair etc. Practical traing imparted to Perform site survey and prepare site Plan (using Chain & tape, Prismatic compass, Plane table, Levelling instrument, Theodolite and Total Station), field book entry, plotting, mapping, calculation of area, by using different survey instrument and observation of all safety aspects is mandatory. The safety aspects covers components like OSH&E, PPE, Fire extinguisher, First Aid and in addition 5S being taught.

Carpentry; Identification of timber and perform sawing and planning using hand and power tools.Sharpening and setting of saw bladeand planer blade/ cutter, surface finishing with exact sizing by planning operation. Preparation of different wooden Joints. (Range of skill - framing joint, Housing joints, broadening joints, Lengthening joints), Making of wooden job as per drawing with timber or alternatives of timber i.e. FRP, MDF, FOAM. Making of doors and windows.

Electrical;Joining of electrical wire and carry out soldering, crimping. Electrical wiring with fixing of accessories conforming ISI rules (Range of skills - different types of Electrical wiring, joining of Fuses,fixing of MCB, connection of lamp with switch and different fitting, etc.), Installation of electrical appliances, Earthing and estimate costing of wiring. Identify different types of transformers, test and use.

Plumbing;pipe connection demonstrating use of Plumbing Tools. joining of pipes with different methods. Cutting and joining of pipes using different types of fittings. Preparation

of layout of soil pipe and waste pipe with different types of sanitary fittings. installation of water meter and removal of air lock. Preparation of water supply system in residential buildings using different types of valves, fittings and appliances are being taught.In addition students are being taught to create objects on 3D modeling concept in CAD.

SECOND YEAR: Concrete Technology; Test and analysis of cement, aggregate, sand, effect of water cement ratio. Preparation of concrete, carry out form work and reinforcement with the application of modern Power Tools. Preparation of reinforcement of different R.C.C. members i,e, Foundation, beams, columns, slabs, Retaining Wall, etc. Erection of scaffolding and making of intricate form work at different locations. Bar bending and preparation of bar bending schedule and calculation of estimated quantity of materials. Making of shuttering & supports for making different types of arches and lintels with chajja. Lay out different types of vertical movement according to shape, location, materials by using stair, lift, ramp and escalator are being taught.

Project Work, Estimating Costing, Maintenance & Management; On site practical training of piling. Preparation of Single Storied Residential Building Plan as per local by law using CAD. Preparation of drawing with ArchiCAD and 3D Max for Solid Modeling of Architectural / Civil 3D Drawing.Preparation of Solid Modeling of Architectural /Civil 3D Drawing using 3d Max and Revit software, Creating 3D model from 2D plane, Lighting and rendering, Quantity calculation of materials using BIM software like Revit, Preparation of rate analysis of different item of works with detailed Specification. Calculation of floor area and carpet area, Preparation of detail estimate of building by centre line method and separate wall method,calculation of quantities of materials involved and preparation of abstract cost for the works. Performing repair Plastering, white washing, painting flooring, replacing of glass, repolishing of floor, stain removal from floor, wooden works. Field training of Foundation failure, Strengthening of foundation, Rectification of leaking roof, repair of expansion joint. Pre construction and Postconstruction anti - termite treatment and Market survey for different materials used in anti termite treatment. Layout of house plumbing and drainage plan, repairing of service main, waist outlet cleaning of sanitary installation, scrapping and painting of pipes of a new site. Field Training on use of Adhesive in timber, tile fixing, jointing in concrete, joint filler & sealing compound. Field Training on different types of construction equipments in Excavation, Hoisting, Conveying, Drilling. Construction Management training i.e. manpower, materials, machines and economy are being taught to work as an assist of civil engineer and perform as Site Supervisor.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of the economy/ labour market. The vocational training programs are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variantsand Apprenticeship Training Scheme (ATS) are two pioneer programs of DGT for propagating vocational training.

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

Candidates broadly need to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
- Perform work with due consideration to safety rules, Govt. Bye laws and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the work
- Check the work as per sketches and rectify errors.
- Document the technical parameters related to the work undertaken.

2.2 PROGRESSION PATHWAYS:

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.Start own agency for construction equipments contract /own building maintenance contract
- Can take admission in Diploma course in notified branches of Engineering by lateral entry.
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming an instructor in ITIs.

- Can join as Assistant supervisor in construction site of high Rise Buildings/Architect's office/Builders.
- Can join advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE:

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

S No.	Course Element	Notional Training Hours	
		1st Year	2nd Year
1	Professional Skill (Trade Practical)	1120	1120
2	Professional Knowledge (Trade Theory)	240	320
3	Workshop Calculation & Science	80	80
4	Employability Skills	160	80
	Total	**1600**	**1600**

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The Continuous Assessment(Internal) during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by Controller of examinations, DGT as per the guidelines. The pattern and marking structure is being notified by DGTfrom time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%. 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. Due consideration should be given while assessing for teamwork, avoidance/reductionofscrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

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

Performance Level	Evidence
(a) Weightage in the range of 60%-75% to be allotted during assessment	
For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce	• Good skill levels in the use of hand

work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices	tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

Civil Engineering Technicians; includes all other Civil Engineering Technicians engaged in construction, survey, and related fields of civil engineering, not elsewhere classified.

Overseer, Civil Engineering; supervisesconstruction of buildings, roads, canals,dams, airfields, drainage systems, etc.according to specifications and attends totheir repair and maintenance underguidance of Engineer In Charge. Receivesdrawings and instruction from Engineer InCharge and studies them. Inspects site,prepares rough estimates and get themapproved by appropriate authority. Undertakescontour surveys and conducts levellingoperations. Marks lay out according toplan and instructions of Engineer InCharge, and commences work under hisguidance and supervision. Checksmaterials and work frequently at everystage of construction to ensure theirconformity with prescribed specifications.Measures completed portion of work andgets them checked and approved by theengineer concerned. Maintains accountsof departmental work and records of day to day measurements, labourengaged,materials used, etc. Gets-wage-bills ofwork charged establishment prepared.May prepare sketches, drawings, ifnecessary.

Reference NCO-2015:

(i) 3112.9900 - Civil Engineering Technicians
(ii) 3112.0100 - Overseer, Civil Engineering

4. GENERAL INFORMATION

Name of the Trade	**CIVIL ENGINEERING ASSISTANT**
Trade Code	DGT/1088
NCO - 2015	3112.9900, 3112.0100
NSQF Level	Level - 5
Duration of Craftsmen Training	Two years (3200 hours)
Entry Qualification	Passed 10thclass examination with Science and Mathematics or its equivalent.
Minimum Age	14 years as on first day of academic session.
Eligibility forPwD	LD, CP, LC, DW, AA, LV, DEAF, AUTISM, SLD, MD
Unit Strength (No. of Student)	24 (There is no separate provision of supernumerary seats)
Space Norms	120 Sq. m
Power Norms	6 KW
Instructors Qualification for:	
(i) Civil Engineering AssistantTrade	B.Voc/Degree in Civil Engineering from recognized AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Civil Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/NAC passed in the trade of "Civil Engineering Assistant" with three years' experience in the relevant field. **<u>Essential Qualification</u>:** Relevant National Craft Instructor Certificate (NCIC) in any of the variants under DGT. ***NOTE: - Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.***
(ii) Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR**

	03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering trades with three years' experience. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade **OR** NCIC in RoDA or any of its variants under DGT
(iii) Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills from DGT institutes. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) **OR** Existing Social Studies Instructors in ITIs withshort term ToT Course in Employability Skills from DGT institutes.
(iv) Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

Distribution of training on Hourly basis: (Indicative only)

Year	Total Hrs /week	Trade Practical	Trade Theory	Workshop Cal. & Sc.	Employability Skills
1st	40 Hours	28 Hours	6 Hours	2 Hours	4 Hours
2nd	40 Hours	28 Hours	8 Hours	2 Hours	2 Hours

5. LEARNING OUTCOME

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

5.1 LEARNING OUTCOMES (TRADE SPECIFIC)

FIRST YEAR

1. Preparefree hand sketches of hand tools used in civil work with proper layout and folding of drawing sheets following safety precaution.
2. Prepare Symbols, Lettering, Numbering, plane figure applying drawing instruments and practice dimensioning Technique as per BIS.
3. Construct plain scale, comparative scale, diagonal scale and vernier scale.
4. Draw orthographic projections of different objects with proper lines and dimensioning.
5. Draw Isometric, oblique and perspective views of different solid, hollow and cut sections with proper lines and dimensions as per standard convention.
6. Draw component parts of a single storied residential building with suitable symbol and scales.
7. Create objects on CAD workspace using Toolbars, Commands, Menus, formatting layer and style.
8. Identify different types of building materials i.e. Stones, Bricks, Lime, Pozzolanic, Cement, Sand, Clay Products, Mortar their characteristic, types, use & function.
9. Mark different types of Foundation and Set out Foundation trenches.
10. Demonstrate different types of brick masonry and Tools used in different bonds. Perform construction of wall - header bond, stretcher bond, English bond, Flemish bond.
11. Perform different types of Plastering & Pointing, rendering & wall cladding.
12. Identify the different types of Protective materials i.e. Paint, Varnish and their application.
13. Demonstrate Damp Proof Course in different position.
14. Prepare different types of Flooring.
15. Perform site survey with Chain/Tape and prepare the site Plan.
16. Perform the site survey using prismatic compass.
17. Perform site survey with plane table and prepare a map.
18. Preparetopography map by contours with levelling instruments.
19. Perform a site survey with Theodolite and prepare site plan.
20. Perform a site survey with Total Station and prepare site plan.
21. Identify timber and perform sawing and planning using hand and power tools.
22. Demonstrate surface finish with exact sizing by planning operation.
23. Prepare different wooden Joints. (Range of skill - framing joint, Housing joints, broadening joints, Lengthening joints)

24. Make small wooden job as per drawing with schedule sizes of timber or alternatives of timber i.e. FRP, MDF, FOAM using various hardware.
25. Make different types of doors and windows with fixing of component.
26. Demonstrate joining of electrical wire and carry out soldering, crimping observing related safety precautions.
27. Demonstrate Electrical wiring with fixing of accessories conforming ISI rules.(Range of skills - different types of Electrical wiring, joining of Fuses, fixing of MCB, connection of lamp with switch and different fitting, etc.)
28. Demonstrate installation of electrical appliances, Earthing and estimate costing of wiring.
29. Identify different type of transformers and test and use.
30. Prepare a Simple pipe connection demonstrating cutting, joining of pipe with different method using different types of fittings.
31. Prepare layout of soil pipe and waste pipe with different types of sanitary fittings.
32. Prepare a water supply system in residential buildings using different types of valves,fittings and appliances.
33. Create objects on 3D modeling concept in CAD.

SECOND YEAR

34. Demonstrate test and analysis of cement, aggregate, sand, effect of water cement ratio.
35. Prepare concrete, carry out simple form work and reinforcement with the application of modern Power Tools.
36. Prepare reinforcement of different R.C.C. members i,e, Foundation, beams, columns, slabs, Retaining Wall, etc.
37. Erect scaffolding and make intricate form work at different locations.
38. Prepare a bar bending schedule and demonstrate bar bending and calculate the estimated quantity of materials.
39. Make different types of arches and lintels with chajja.
40. Lay out different types of vertical movement according to shape, location, materials by using stair, lift, ramp and escalator.
41. Explain pile foundation.
42. Prepare a Single Storied Residential Building Plan as per local by law using CAD.
43. Demonstrate ArchiCAD and 3D Max for Solid Modeling of Architectural / Civil 3D Drawing.
44. Prepare Solid Modelling of Architectural /Civil 3D Drawing using 3d Max and Revit software.
45. Work out rate analysis of different item of works with detailed Specification.
46. Prepare a detail estimate of one room building by centre line method and separate wall method, calculate the quantities of materials involved from the above estimated quantities& prepare a abstract of cost for the above item of works.

47. Perform repair Plastering, white washing, painting flooring, replacing of glass, repolishing of floor, stain removal from floor, wooden works.
48. Perform field training of Foundation failure, Strengthening of foundation, Rectification of leaking roof, Repair of expansion joint.
49. Demonstrate anti - termite treatment and Market survey for different materials used in anti termite treatment.
50. Layout of house plumbing and drainage plan, repairing of service main, waist outlet cleaning of sanitary installation, scrapping and painting of pipes of a new site.
51. Demonstrate use of Adhesive in timber, tile fixing, jointing in concrete, joint filler & sealing compound.
52. Demonstrate different types of construction equipments in Excavation, Hoisting, Conveying, Drilling.
53. Demonstrate Construction Management i.e. manpower, materials, machines and economy.

ASSESSABLE OUTCOME	ASSESSMENT CRITERIA
FIRST YEAR	
1. Prepare free hand sketches of hand tools used in civil work with proper layout and folding of drawing sheets following safety precaution.	Ensure data and information received are sufficient for preparation of drawing.
	Sketch horizontal lines from left to right, vertical lines downward, inclined lines in different angles by freehand.
	Draw freehand sketches of tools (viz. hoe, head pan, trowel, wooden float, plumb bob, sand screener).
	Check the drawings to confirm their compliance with the supplied design / object.
2. PrepareSymbols, Lettering, Numbering, plane figure applying drawing instruments and practice dimensioning Technique as per BIS.	(a) prepare Layout of drawing sheet, (b) prepare a Title block, (c) set and fix drawing paper on the drawing board, (d) mark and fold on the designated drawing Sheet.
	(a) draw parallel lines using T-square and set-square (b) draw angles of 15° increments by combination of set-squares and check by protractor.
	(a) construct different types of geometrical figuresfrom given data (b) construct ellipse with the given conditions.and parabolic curves using the various conditions given.
	Add dimensions as per the drawing requirements provided and use relevant and appropriate symbols as per drawing requirement to provide details in the drawings.
	(a) Prepare lettring in full scale 25 mm. height size in Vertical & Italic system in 7:4 & 5:4 single stroke & double stoke method both in small & Capital letter. (b) Prepare Numbering in full scale 25 mm. height size in Vertical & Italic system in 7:4 & 5:4 single stroke & double stoke method both. (c) Draw different figures showing different dimensioning system Aligned & Unidirectional.
	Check the drawings to confirm their correctness.
3. Construct plain scale, comparative scale, diagonal scale and vernier scale	Read and interpret the drawing requirements. Ensure data and information received are sufficient for preparation ofdrawing.
	Draw different types of scales.
	Find out R.F of the scale, calculate the length of scale on drawing.
	Construct plain scales, comparative scales, diagonal scales

	andvernierscales,mark the distance on the scale.
	Check the drawings to confirm their correctness.
4. Draw orthographic projections of different objects with proper lines and dimensioning.	Read and interpret the drawing requirements. Ensure dataand information received are sufficient for preparation ofdrawing.
	Carry out necessary calculations to compute dimensions of Various components/ parts of drawings.
	(a) develop view in orthographic projection by placing object between horizontal and vertical plane of axes, (b) generate side view of blocks in different inclination on VP and HP by auxiliary vertical plane.
	(a) write name of the drawing on heading at centre alignment, (b) write individual title for every projection drawing, (c) construct drawing views, construction lines and dimension lines as per standard.
	Check the drawings to confirm their compliance with the supplied design / object.
	Draw orthographic projection of line in different plane and in different Position.
	Draw orthographic projection of Plane figure in different plane and in different Position.
	Draw orthographic projection of Solid figure in different plane and in different Position.
	Draw orthographic projection of Section of Solid in different plane and in different Position.
5. Draw Isometric, oblique and perspective views of different solid, hollow and cut sections with proper lines and dimensions as per standard convention.	Read and interpret the drawing requirements. Ensure dataand information received are sufficient for preparation ofdrawing.
	Carry out necessary calculations to compute dimensions ofVarious components/ parts of drawings.
	construct an Isometric scale to a given length. draw the isometric projection of regular solids.
	Draw the isometric views for the given solids with hollow and cut sections.
	Draw three views of different isomertic objects to Orthoghraphic.
	Draw the oblique views for the given solids with hollow and cut sections.
	Draw the perspective views for the given solids with hollow and cut sections.
	Check the drawings to confirm their compliance with the

	supplied design / object.
6. Draw component parts of a single storied residential building with suitable symbol and scales.	Read and interpret the drawing requirements such as rough sketches, specifications, drawing brief, RFD etc. ensure data and information received are sufficient for preparation of drawing.
	Construct parts of a building and list the sequence of construction.
	Draw and indicate the levels of different parts of building.
	Draw dressing and varieties of finishes, artificial stones, natural bed of stone.
	Draw RCC used in different component parts of a building.
	Draw timber joints used in doors, windows and arches.
	Draw steel framing for pre-cast concrete.
	Use codes and other references that follow the required conventions.
	Draw the appropriate signs and symbols for showing different types of openings used in drawing.
	Draw the signs and symbols of various types of doors windows and ventilators.
	Check the drawings to confirm their compliance with the upplied design / object.
7. Create objects on CAD workspace using Toolbars, Commands, Menus, formatting layer and style.	Ensure that computer system is correctly operating. Check that allrequired peripheral devices are connected and correctly operating.
	Start up the software and adjust the page size, measurementunit, scale and plot area before staring the work.
	Set drawing parameters like, colour, layer, line type, lineweight, text font etc. prepare title block for the drawing covering specification required.
	Draw 2D drafting by using CAD toolbars and from set oftool icons in ribbon.
	Draw drawing using sortcut keyboard command, creating templates, inserting drawings, Layers, Modify Layers.
	Customize Dimension and Text styles.
	Provide title and dimension on object drawing.
	Add Symbols and specifications and use codes and other references as per the drawing requirement.
	Check drawings to confirm their compliance with the required design.
	Create layout space and viewports.
	Plot the drawing with required scale.

8. Identify different types of building materials i.e. Stones, Bricks, Lime, Pozzolanic, Cement, Sand, Clay Products, Mortar their characteristic, types, use & function.	Identify different types of building materials i.e. Stones, Bricks, Lime, Pozzolanic, Cement, Sand, Clay Products, Mortar.
	Carry out task according to their characteristic, types, use & function in different civil engineering structure.
9. Mark different types of Foundation and Set out Foundation trenches.	Read and interpret the drawing, ensure data and information received are sufficient for completion of task.
	carry out necessary calculations to compute dimensions of Various components/ parts of drawings.
	Mark different types of shallow and deep foundation.
	(a) Mark footing for column, (b) Mark footings for wall, (c) Mark stepped foundation and inverted arch foundation,
	(a) Mark grillage foundation (b) Mark raft foundation
	(a) Mark various types of pile foundation, (b) Mark pier foundation, (c) Mark well foundation (caisson),
	Check markings to confirm their compliance with thesupplied drawing.
10. Demonstrate different types of brick masonry and Tools used in different bonds.Perform construction of wall - header bond, stretcher bond, English bond, Flemish bond.	Read and interpret the drawing, ensure data and information received are sufficient for completion of task.
	Arrange required materials to construct a wall.
	Perform construction of wall – (a) header bond, (b) stretcher bond, (c) English bond, (d) Flemish bond .
	Check the work to confirm their compliance with the supplied drawing.
11. Perform different types of Plastering & Pointing, rendering & wall cladding.	Plan for different types of Plastering & Pointing.
	Arrange required materials to perform different types of Plastering & Pointing, rendering & wall cladding.
	prepare surface for plastering, rendering & wall cladding.
	Perform different types of Plastering & Pointing, rendering & wall

	cladding.
	Examine defects and demonstrate remedies of plastering.
	Check the work to confirm their compliance with therequired quality.
12. Identify the different types of Protective materials i.e. Paint, Varnish and their application.	Identify different types of Protective materials i.e. Paint, Varnish, etc.
	Plan for application of different types of Protective materials.
	Arrange required materials for application of different types of Protective materials.
	prepare surface for application of different types of Protective materials.
	Perform application of different types of Protective materials.
	Examine defects and demonstrate remedies in application of different types of Protective materials.
	Check the work to confirm their compliance with thereqired quality.
13. Demonstrate Damp Proof Course in different position.	Read and interpret the drawing and ensure data and information received are sufficient for D.P.C. in different position.
	Plan to perform D.P.C. in different position.
	Arrange required materials to perform D.P.C. in different position.
	prepare location to perform D.P.C. in different position.
	Perform D.P.C. in different position. a. damp proofing in basement. b. damp proofing in external wall c. damp proofing in internal walls d. damp proofing by cavity wall. e. damp proofing in flat roof and parapet wall. f. damp proofing of flat roof by tar felting g. damp proofing by mud phuska terracing with tile, h. damp proofing in pitched roof.
	Examine defects and demonstrate remedies in D.P.C. and termite treatment.
	Check the work to confirm their compliance with therequired quality.
14. Prepare different types of Flooring	Read and interpret the drawing and ensure data and information received are sufficient for flooring in different position.
	Plan to perform flooring in different position.
	Arrange required materials to perform flooring in different position.
	prepare location to perform flooring in different position.

	Perform flooring in different position: a. flooring on timber ground floor, b. flooring on brick floor, c. flooring on flag stone, d. flooring on concrete floor, e. flooring on terrazzo floor, f. flooring of mosaic floor, g. flooring by Tiles Floor, h. flooring on single joist timber floor.
	Examine defects and demonstrate remedies in flooring.
	Check the work to confirm their compliance with therequired quality.
15. Perform site survey with Chain/Tape and prepare the site Plan.	Interpret the drawing requirements.
	perform surveying measuring distance by chain, tape and other accessories.
	Enter measured data in field book and plotting the same.
	Conduct the chain surveying and prepare the site map.
	Calculate the area of the plot.
	Add specifications and use codes and other references as perthe drawing requirements.
	Check drawings to confirm their compliance with therequired plan.
16. Perform the site survey using prismatic compass.	Interpret the drawing requirements.
	Observe the bearings of lines and conduct the traverse survey using compass and other accessories.
	Enter Field book, Compute the correct bearingsand plotting.
	Calculate area and check the traverse.
	Prepare the site map.
	Add specifications and use codes and other references as perthe drawing requirements.
	Check drawings to confirm their compliance with therequired plan.
17. Perform site survey with plane table and prepare a map.	Interpret the drawing requirements.
	Perform plane table survey by the following methods: a. Radiation b. Intersection c. Traversing d. Resection (Orientation)
	Prepare the traverse by any type of method.
	Calculate area.

	Prepare the site map.
	Add specifications and use codes and other references as perthe drawing requirements.
	Check drawings to confirm their compliance with the required plan.
18. Preparetopography map by contours with levelling instruments.	Interpret the drawing requirements.
	Set levelling instrument and adjust the horizontal control.
	Fix vertical control of points by levelling and booking readings in level book.
	Determine reduced levels and check.
	prepare a road project for a limited distance.
	prepare a plot by contours, fix contour interval, interpolate contour points and draw contour lines.
	Furnish all the details and complete the drawing.
	Check drawings to confirm their compliance with the required design and take out the print.
19. Perform a site survey with Theodolite and prepare site plan	Interpret the drawing requirements.
	Conduct reconnaissance survey, prepare key plan.
	Mark station points.
	Prepare reference sketches.
	Measure lengths and bearing.
	Measure angles, repetition.
	Compute co-ordinates, check angles, calculate bearings, find consecutive co-ordinates, find independent co-ordinates.
	Prepare the traverse.
	Calculate area.
	Add specifications and use codes and other references as per the drawing requirements.
	Check drawings to confirm their compliance with therequired design.
20. Perform a site survey with Total Station and prepare site plan.	Interpret the drawing requirements.orientation-collect data-repeat same procedure at each stations.
	Adjust and fix the Total Station in an station point.
	Conduct reconnaissance survey-prepare key plan.
	Prepare reference sketches.
	Conduct traverse survey-set up the instrument over the first station-set job-set station-orient-collect data-take foresight to next station-shift instrument to next station-set up-back.

	Download and process the data, prepare plan/map.
	Measure remote distance and elevation.
	Calculate 2D / 3D area on field/site.
	Calculates surface volume of field/site.
	Add specifications and use codes and other references as per the drawing requirements.
	Check drawings to confirm their compliance with the required one.
21. Identify timber and perform sawing and planning using hand and power tools.	Identify different wooden sample piece i.e.- soft wood & hard wood, wooden grains etc. & their applications.(Annual ring, knots, shakes & chicks etc.)
	Demonstrate application of hand tools, measuring tools, and work holding devices.
	Demonstrate use of different power tools, viz. saws, drills, etc.
	Perform sawing, planning,Moulding, Rebating, Chamfering, etc. using different types of saws, and plains.
	Sharpen and set different type saw bladeand planer blade/ cutter.
	Check the product to confirm their compliance with the desired one.
22. Demonstrate surface finish with exact sizing by planning operation	Read and Interpret the drawing requirements.
	Perform Planning face, face edge, etc.
	Demonstrate the use of marking, mortise gauge etc.
	Test the accuracy of flatness and twist-ness of the surface by using try square.
	Demonstrate the use of winding strips, cross planning, edge planning.
	Demonstrate portable power planer machine and its function.
	Check the product to confirm their compliance with the drawing.
23. Prepare different wooden Joints. (Range of skill - framing joint, Housing joints, broadening joints, Lengthening joints)	Read and Interpret the drawing requirements.
	Carry out necessary calculations to compute dimensions of Various components/ parts.
	Ascertain required timber, tools and other materials to carry out the performance.
	Make framing joint - Mortise and tenon Joint (Single and double, Plain hunched, Mitre corner).
	Make Housing joints - Full housing, Bridle, Stopped housing.
	Make broadening joints - Simple butt joint, Riveted butt joint, etc.
	Make Lengthening joints:End half lap joint, End over lap joint, End bends lap joint,slopping scarf, racking scared, half lapping scarf,

	table scarf joint etc.
	Check joints to confirm their compliance with the required design.
24. Make small wooden job as per drawing with schedule sizes of timber or alternatives of timber i.e. FRP, MDF, FOAM using various hardware.	Read and Interpret the drawing requirements.
	Carry out necessary calculations to compute dimensions of Various components/ parts.
	Ascertain required timber, tools and other materials to carry out the performance.
	Perform making of wooden job as per drawing.
	Check the job to confirm their compliance with the required design.
25. Make different types of doors and windows with fixing of component.	Read and Interpret the drawing requirements.
	Carry out necessary calculations to compute dimensions of Various components/ parts.
	Ascertain required timber, tools and other materials to carry out the performance.
	Perform making of different Types doors including panelled, glazed and flush door as per drawing.
	Perform making of Different types windows and ventilators as per drawing.
	Check the job to confirm their compliance with the required design.
26. Demonstrate joining of electrical wire and carry out soldering, crimping observing related safety precautions.	Read and Interpret the drawing requirements.
	Carry out necessary calculations to ascertain required wire and arrange tools and other materials to carry out the performance.
	Identify various types of cables and measure conductor size using SWG and micrometer.
	Prepare terminations of cable ends, perform skinning, twisting and crimping.
	Perform simple twist, married, Tee and western union joints.
	Perform britannia straight, britannia Tee and rat tail joints.
	Perform Soldering of joints / lugs.
	Check the job to confirm their compliance with the required design.
27. Demonstrate Electrical wiring with fixing of accessoriesconforming ISI rules (Range of skills - different types of Electrical wiring, joining	Read and Interpret the drawing requirements.
	Carry out necessary calculations to ascertain required wire and arrange tools and other materials to carry out the performance.
	Demonstrate different electrical wiring system with fixing of different accessories as per standard procedure.
	Make electrical Fuse joints, fixing MCB.

of Fuses, fixing of MCB, connection of lamp with switch and different fitting, etc.)	Connect lamps with switches.
	Perform Stair case circuit wiring.
	Perform Godownwiring.
	Perform Hospital wiring.
	Check the performance to confirm their compliance with the required one.
28. Demonstrate installation of electrical appliances, Earthing and estimate costing of wiring.	Read and Interpret the drawing requirements.
	Carry out necessary calculations to ascertain required wire and arrange electrical appliances, tools and other materialsto carry out the performance.
	Install and connect electrical appliances and take reading with Voltmeter.
	Install earthing in different position.
	Prapare an estimation and costing of materials and wiring.
	Check the performance to confirm their compliance with the requirment.
29. Identify different type of transformers and test and use.	Read and Interpret the drawing requirements.
	Carry out necessary calculations to ascertain required wire, transformer and arrange required tools and other materialsto carry out the performance.
	Identify transformer, test and install.
	Check the performance to confirm its compliance with the requirement.
30. Prepare a Simple pipe connection demonstrating cutting, joining of pipe with different method using different types of fittings.	Read and Interpret the drawing requirements.
	Carry out necessary calculations to ascertain required pipe and arrange required tools and other materialsto carry out the performance.
	Perform cutting, threading, drilling and taping on pipe.
	Prepare a simple pipe connection using different pipe fittings and joints.
	Perform Joining of pipe with thread joint.
	Perform Joining of pipe with lead joint.
	Perform Joining of pipe with flange joint.
	Perform Joining of pipe with cement joint.
	Perform Joining of pipe with D. Joint etc.
	Perform Fixing of ferrule on pipe.
	Check the performance to confirm its compliance with the drawing.

31. Prepare layout of soil pipe and waste pipe with different types of sanitary fittings.	Read and Interpret the drawing requirements.
	Carry out necessary calculations to ascertain required pipe, sanitary fittings and arrange required tools and other materialsto carry out the performance.
	Prepare Layout of soil pipe and waste pipe with different sanitary fitting.
	Perform fitting of I.W.C with high level cistern.
	Perform fitting of washbasin.
	Perform fitting of E.W.C. with low level cistern.
	Perform fitting of kitchen sink.
	Perform fitting of bath tub.
	Perform fitting of urinal pot with auto cistern.
	Check the performance to confirm its compliance with the drawing.
32. Prepare a water supply system in residential buildings using different types of valves,fittings and appliances.	Read and Interpret the drawing requirements.
	Ascertain requirement of pipes, valves,fittings and appliances and arrange required tools and other materialsto carry out the performance.
	Perform installation of water meter.
	Demonstrate removal of air lock.
	Demonstrate determination of pH by pH meter. Analysis and treatment of Effluent water.
	Demonstrate reconditioning of taps, valves & flushing tank and test for correct functioning.
	Prepare a water supply pipe line system in residential buildings using different types of valves, fittings and appliances.
	Check the performance of water supply system.
33. Create objects on 3D Modelling concept in CAD	Interpret the drawing requirements.
	Prepare different objects on 3D Modelling using CAD.
	Check the performance to confirm its compliance with therequirements.
SECOND YEAR	
34. Demonstrate test and analysis of cement, aggregate, sand, effect of water cement ratio.	Plan for test and analysis of Construction materials.
	Test cement for consistency, setting times & strength.
	Conduct field tests for adulteration.
	Make proper arrangement to store cement at site.
	Perform sieve analysis on aggregate.
	Determine grading, fineness modulus.

	Determine presence of silt and clay.
	Perform test to determine shape & size of aggregate.
	Perform test to determine bulking of sand.
	Perform test and analyse the effect of water cement ratio (w/c) on strength of cement.
35. Prepare concrete, carry out simple form work and reinforcement with the application of modern Power Tools.	Read and Interpret the drawing requirements.
	Plan for Preparation of concrete, carring out form work and reinforcement.
	Demonstrate Batching, Mixing, Transportation, Placing and Compaction.
	Demonstrate all operations taking necessary precautions related to from work and reinforcement.
	Prepare concrete and lay at required place using power tools.
	Demonstrate Curing and Finishing.
	Test strength of concrete.
	Demonstrate removal of form work.
36. Prepare reinforcement of different R.C.C. members i,e, Foundation, beams, columns, slabs, Retaining Wall, etc.	Read and Interpret the drawing requirements.
	Plan for Preparation of reinforcement of different R.C.C. members.
	Demonstrate structural arrangements of different RCC.
	Members: a. Prepare reinforcement for Foundations. b. Prepare reinforcement for Rectangular beam. c. Prepare reinforcement for Column. d. Prepare reinforcement for Floor slab / roof slab. e. Prepare reinforcement for Lintel with chajja. f. Prepare reinforcement for stair. g. Prepare reinforcement for underground and overhead reservoir. h. Prepare reinforcement for Lift pit. i. Prepare reinforcement for septic tank. j. Prepare reinforcement for retaining wall.
	Check the performance to confirm its compliance with the Drawing.
37. Erect scaffolding and make intricate form work at different locations.	Read and Interpret the drawing requirements.
	Plan for Erection of scaffolding and making intricate form work.
	Select appropriate material for form work at different locations.
	Erect scaffolding & make form work at different locations.

	Check, Identify defects & rectify form work.
38. Prepare a bar bending schedule and demonstrate bar bending and calculate the estimated quantity of materials.	Read and Interpret the drawing requirements.
	Make a plan for bar bending.
	Prepare a bar bending schedule of different RCC members.
	Demonstrate different operations in bar bending – a. straightening of bars, b. cutting of bars, c. bending of bars, d. placing of bars, e. binding of bars, f. fixing of cover blocks.
	Make an estimate for quantity of steel and binding wire required for a given job.
	Check to confirm their compliance with the drawing.
39. Make different types of arches and lintels with chajja	Read and Interpret the drawing requirements.
	Plan for makingdifferent types of arches and lintels with chajja.
	Demonstrate making of shuttering & supports with uprights and wedges for Arches, Lintels and Lintels with Chajjahs.
	Demonstrate cutting, bending & placing of reinforcement.
	Demonstrate mixing, placing & compacting concrete.
	Demonstrate spanning of opening with a semi-circular arch, making centering, cutting of templates for voussoirs&preparing voussoirs, setting uprights of arch.
	Demonstrate Construction of arch & removing centering.
40. Lay out different types of vertical movement according to shape, location, materials by using stair, lift, ramp and escalator.	Read and Interpret the drawing requirements for vertical movements.
	Plan for making lay out of different types of vertical movement according to shape, location, materials.
	Demonstrate Lay out of straight stairs made of wood.
	Demonstrate Lay out of open well stairs made of brick.
	Demonstrate Lay out of dog- legged stairs made of steel.
	Demonstrate Lay out of geometrical and bifurcated stairs made of RCC.
	Demonstrate Lay out of spiral stairs made of steel.
	Demonstrate Lay out of Lift and Escalator.
	Check lay out to confirm their compliance with the required design.
41. Explain pile foundation.	Read and Interpret the drawing requirements for pile

	foundation.
	Make a plan for pile foundation.
	Make a schedule for materials required for pile foundation.
	Prepare a lay out of pile foundation as per drawing.
42. Prepare a Single Storied Residential Building Plan as per local by law using CAD.	Read and interpret the drawing requirements such as roughsketches, specifications, drawing brief, RFD etc. ensure dataand information received are sufficient for preparation ofdrawing.draw size and position of rooms, wall thickness and number of openings.
	Carry out necessary calculations to compute dimensions of Various components/ parts of drawings.
	Draw the line diagram of the Single Storied residential building.
	(a) develop the sectional plan of building (b) Prepare sectional elevation as per the section plan (c) draw the elevation of building. (d) prepare working drawing of the building.
	Draw various interior and exterior furnishings details of a Single Storied residence.
	Create a site plan showing details.
	Prepare a key / location plan.
	Prepare area statement.
	Add Symbols and specifications and use codes and other references as per the drawing requirements.
	Check drawings to confirm their compliance with the required design.
43. Demonstrate ArchiCAD and 3D Max for Solid Modelling of Architectural / Civil 3D Drawing.	Demonstrate ArchiCAD and 3D Max for Solid Modelling of Architectural / Civil 3D Drawing.
	Apply Software in Civil Engineering field to prepare drawing with ArchiCAD and 3D Max for Solid Modelling of Architectural / Civil 3D.
	Check drawings to confirm their compliance with the required design.
44. Prepare Solid Modelling of Architectural /Civil 3D Drawing using 3d Max and Revit software.	Read and interpret the drawing requirements such as roughsketches, specifications, drawing brief, RFD etc. ensure dataand information received are sufficient for preparation ofdrawing.
	Carry out necessary calculations to compute dimensions of Various components/ parts of drawings.
	Prepare 3D model using 3d Max software.

	Create 3D model from 2D plane.
	Make Lighting and rendering.
	Prepare material editor using BIM software like Revit.
	Calculate quantity of materials.
45. Work out rate analysis of different item of works with detailed Specification.	Read and interpret the drawing requirements, specifications, etc. ensure data and information received are sufficient for preparation of rate analysis.
	Carry out necessary calculations to compute estimation and cost analysis.
	Calculate floor area and carpet area.
	Calculate FAR.
	Preapare rate analysis and identify the units of measurement.
	Calculate quantities of materials and prepare rate analysis from standard data.
	Calculate quantities of labour required for different item of work from standard data.
	Calculate the rate per unit of works of different items including labour charges from schedule of rate.
	Prepare rate analysis of works for Plant machinery.
	Prepare rate analysis of works for over head charge, Profit with the details specification.
	Check rate analysis to confirm their compliance with the design.
46. Prepare a detail estimate of one room building by centre line method and separate wall method, calculate the quantities of materials involved from the above estimated quantities& prepare a abstract of cost for the above item of works.	Read and interpret the drawing requirements, specifications, etc. ensure data and information received are sufficient for preparation of estimation.
	Carry out necessary calculations to compute estimation and cost analysis.
	Prepare detailed estimate of a building by centre line method and separate wall method.
	Prepare a detailed estimate for – boundary wall, septic tank,underground and overhead reservoir.
	Calculate the quantities of materials in the standard format.
	Prepare abstract of estimate.
	Check estimation and cost analysis to confirm their compliance with the design.
47. Perform repair Plastering, white washing, painting flooring, replacing of	Identify the cracks and defect of Plastering, walls for white washing and painting, area for flooring, replacing of glass, repolishing of floor, stain removal from floor, wooden works and remedy of the

glass, repolishing of floor, stain removal from floor, wooden works.	defects.
	Prepare estimation and cost analysis for the identified work.
	Make scaffolding for plastering or white washing.
	Demonstrate removal of cracks and defect of Plastering.
	Perform white washing and painting on walls.
	Demonstrate removal of cracks and defect of flooring
	Perform replacing of glass.
	Demonstraterepolishing of floor and stain removal from floor.
	Demonstrate wooden works and remedy of the defects.
48. Perform field training of Foundation failure, Strengthening of foundation, Rectification of leaking roof, Repair of expansion joint.	Identify the Foundation failure, defects in structure, leaking roof, defects in expansion joint.
	Prepare estimation and cost analysis for the identified work.
	Demonstrate Strengthening of foundation.
	Demonstrate repairing of defects in structure.
	Perform rectification of leaking roof.
	Demonstrate repair of expansion joint.
49. Demonstrate anti - termite treatment and Market survey for different materials used in anti termite treatment.	Identify locations for Anti-termite treatment.
	Plan to perform Anti-termite treatment.
	Make a Market survey for different materials used in anti termite treatment and Prepare an estimate.
	Arrange required materials for anti - termite treatment
	Perform anti - termite treatment in different position - Pre construction treatment Post construction treatment
	Check the work to confirm their compliance with the reqired quality.
50. Layout of house plumbing and drainage plan, repairing of service main, waist outlet cleaning of sanitary installation, scrapping and painting of pipes of a new site.	Layout the house plumbing and drainage plan.
	Plan for repairing of service main, waist outlet cleaning of sanitary installation, scrapping and painting of pipes.
	Demonstrate house plumbing and drainage.
	Perform repairing of service main, waist outlet cleaning of sanitary installation.
	Demonstrate scrapping and painting of pipes.
	Prepare estimation and cost analysis for the identified work.
	Check the work to confirm their compliance with the reqired quality.
51. Demonstrate use of	Demonstrate use of adhesive in timber.

Adhesive in timber, tile fixing, jointing in concrete, joint filler & sealing compound.	Demonstrate tile fixing.
	Demonstrate jointing in concrete, joint filler & sealing compound.
	Check the work to confirm their compliance with the reqired quality.
52. Demonstrate different types of construction equipments in Excavation, Hoisting, Conveying, Drilling.	Identify the different types of construction equipments in Excavation, Hoisting, Conveying, Drilling.
	Dramatize operation of construction equipments in Excavation.
	Dramatize operation of construction equipments in Hoisting.
	Dramatize operation of construction equipments in Conveying.
	Dramatize operation of construction equipments in Drilling.
53. Demonstrate Construction Management i.e. manpower, materials, machines and economy.	Prepare and demonstrate a schedule of work in construction site.
	Demonstrate the technique of handling different site problems, solve the problem properly.
	Demonstrate the technique of controlling manpower.
	Demonstrate the technique of handling materials and payment of different items .
	Prepare and demonstrate register book to record the different purchase of materials, labour payment, tools & equipments.

SYLLABUS FOR CIVIL ENGINEERING ASSISTANT TRADE			
FIRST YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 56 Hrs; Professional Knowledge 12 Hrs	Prepare free hand sketches of hand tools used in civil work with proper layout and folding of drawing sheets following safety precaution.	1. Importance of trade training, demonstrate tools & equipments used in the trade. (2 hrs) 2. Importance of housekeeping & good shop floor practices. (2 hrs) 3. Occupational Safety &Health :Introduction to safety equipments and their uses. Introduction of first aid. Health, Safety and Environment guidelines, legislations & regulations as applicable. (4 hrs) 4. Disposal procedure of waste materials of the trade. (3 hrs) 5. Personal protective Equipments(PPE):-Basic injury prevention, Basic first aid. (4 hrs) 6. Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. (3 hrs) 7. Preventive measures for electrical accidents&steps to be taken in such	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. Soft Skills: its importance and Job area after completion of training. Introduction of First aid. Introduction of PPEs. Introduction to 5S concept& its application. Response to emergencies e.g.; power failure, fire alarm, etc.(06 hrs)

		accidents. (2 hrs) 8. Use of Fire extinguishers. (8 hrs.)	
		9. Awareness about the job sheets made by the ex. trainees. (2 hrs) 10. Use of drawing instruments and equipment with care. (3 hrs) 11. Method of fixing of drawing sheet on the drawing board. (3 hrs) 12. Layout of different size of Drawing sheets and folding of sheets. (6 hrs) 13. Draw free hand sketch of hand tools used in civil work.(14 hrs)	• Familiarisation& information about rules and regulations of the Institute and Trade. • Overview of the subjects to be taught for each year. • List of the Instruments, equipments and materials to be used during training.(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Prepare Symbols, Lettering, Numbering, plane figure applying drawing instruments and practice dimensioning Technique as per BIS.	14. Symbols &conventional representation for materials in sections as per IS 962-1989, SP-46:2003 for building drawings. (06 hrs) 15. Draw types of Lines, lettering and numbering as per IS 962- 1989, SP-46:2003. (10 hrs) 16. Construction of plain geometrical figures. (12 hrs)	• Importance of B.I.S. • Introduction of Code for practice of Architectural and Building Drawings (IS: 962-1989, SP-46:2003). • Layout of drawing. Lines, Lettering, Dimensioning. (06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Construct plain scale, comparative scale, diagonal scale and vernier scale	17. Construction of scales – Plain, comparative, diagonal, vernier& scale of cords. (28 hrs)	• Knowledge of different types of scale. Principle of R.F. (06 hrs)
Professional Skill 56 Hrs; Professional Knowledge	Draw orthographic projections of different objects	Drawing of :- 18. Construction of solid geometrical figures. (20 hrs)	• Different types of projection views: Orthographic, Isometric, Oblique and Perspective.

12 Hrs	with proper lines and dimensioning.	19. Three views in Orthographic Projection of Solid objects & section of solids. (36 hrs)	(12 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Draw Isometric, oblique and perspective views of different solid, hollow and cut sections with proper lines and dimensions as per standard convension.	20. Isometric, oblique and perspective views of geometrical solids, hollow and cut sections. (28 hrs)	• - DO - (06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Draw component parts of a single storied residential building with suitable symbols and scales.	Drawing of :- 21. Component parts of a single storied residential building. (in sectional details) Showing Foundation, Plinth, Doors, Windows, Brick work, Roof, Lintel and Chajjah, Arches, etc. (28 hrs)	Building materials:- • *Timber*:- Types, Structure, disease & defects, characterstic, seasoning, preservation and uitility. • Alternaative material to Timber • Plywood, Block board, Particle board, Fire proof reinforced plastic (FRP), Medium density fireboard (MDF) etc. • Tar, bitumen, asphalt:- Properties, application and uses.(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Create objects on CAD workspace using Toolbars, Commands, Menus, formatting layer and style.	22. Function of keys and practice of basic commands. (05 hrs) 23. Use of elementary commands by CAD toolbar. (03 hrs) 24. Creation of objects in different layers on CAD workspace. (04 hrs) 25. Plotting of drawing from CAD. (02 hrs) 26. 2D drafting of flash door,	Computer aided drafting:- • Operating system, Hardware & software. • Introduction of CAD. • Its Graphical User Interface. • Method of Installation. • Basic commands of CAD. • Knowledge of Tool icons and set of Toolbars. Knowledge of shortcut keyboard commands.

		panel door, window, hand railing, wash basin, sewerage pipe joints, etc. (10 hrs) 27. Preparing Library folder by creating blocks of the above items. (04 hrs)	(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Identify different types of building materials i.e. Stones, Bricks, Lime, Pozzolanic, Cement, Sand, Clay Products, Mortar their characteristic, types, use & function.	28. Identify different types of bricks, uses and hollow bricks. Standard size of bricks available at local market. (04 hrs) 29. Identify different types of stones, types and uses. (04 hrs) 30. Identify different types of tiles, types and uses. (03 hrs) 31. Identify different types of cement, types and uses, field test of cement. Etc. (03 hrs) 32. Identify different types of sand and aggregates, types and uses. (03 hrs) 33. Identify different types of lime, types and uses. (03 hrs) 34. Identify different types of steel, types and uses. (04 hrs) 35. Identify different types of timber, earthen ware, types and uses. (04 hrs)	Materials:- • Stones :– characteristics, types & uses. • Bricks :– Manufacturing, characteristics of good bricks, types,uses and hollow bricks. • Lime :– characteristics, types, manufacturing & its uses. • Pozzolanic :- characteristics, types & uses. *Cement* :– Manufacturing, characteristics, types, uses and test of good cement. Building materials:- • Sand:- characteristics, types & uses. • Clay Products :– types, earthenware, stoneware, porcelain, terracotta, glazing. *Mortar*&*Concrete*:– Types,uses, preparation, proportion, admixtures and applications. (06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Mark different types of Foundation and Set out Foundation trenches.	36. Setting out a building: Obtaining first, second, third & fourth lines, marking diagonals, setting out cross walls & offsets. (13 hrs)	Building Construction:- Foundation:- • Purpose of foundation • Causes of failure of foundation • Bearing capacity of soils

		37. Marking excavation lines & fixing of plinth & floor levels. (05 hrs) 38. Set out foundation trench. (10 hrs)	• Dead and live loads • Examination of ground • Types of foundation – (Spread Footing, Grillage foundation, Pile foundation, Raft foundation, Well foundation, Special foundation) • Drawing of footing foundation setting out of building on ground excavation • Simple machine foundation. (06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Demonstrate different types of brick masonry and Tools used in different bonds. Perform construction of wall - header bond, stretcher bond, English bond, Flemish bond.	39. Demonstrate the use of brick masonry tools. (04 hrs) 40. Perform construction of wall header bond, stretcher bond, English bond, Flemish bond (24 hrs)	Building Construction:- • Sequence of construction of a building. • Name of different parts of building. • Brick masonry:- • Terms, use and classification.. • Strength of walls. • Strength of masonry. • principles of construction of bonds. Tools and equipments used.(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Perform different types of Plastering & Pointing, rendering & wall cladding.	41. Make scaffolding and prepare surface for plastering. (06 hrs) 42. Perform plastering operation at different surface - Plaster in two coats -External finishes— sand finish, textured finish. (14 hrs) 43. Perform rendering & wall cladding. (08 hrs)	Plastering : Types, thickness in different position, materiels, tools used, defects and remedies, surface preparation for rendering & wall cladding. Special meterials used in plastering. Types of plaster finishes.(06 hrs)
Professional Skill 28 Hrs;	Identify different types of	44. Perform application of cement paint on different	Protective materials:- • *Paints*:- characteristic,

Professional Knowledge 06 Hrs	Protective materials i.e. Paint, Varnish and their application.	surfaces(07hrs) 45. Perform application of plastic emulsion on different surfaces(08 hrs) 46. Perform application of enamel paint on different surfaces(05 hrs) 47. Perform application Process of varnishing on different surfaces(08 hrs)	types, uses. • *Varnishes* :– characteristics and uses.(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Demonstrate Damp Proof Course in different position.	48. Perform Laying of D.P.C with proper methods and Materials. (28 hrs)	Treatments of building structures:- • DPC Sources and effects of dampness • Method of prevention of dampness in building • Damp proofing materials – properties, function and types.(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Prepare different types of Flooring	**Flooring practice:** 49. Determination and Formation of slope / level, laying of Base Layers, laying of Topping,application of slurry for finishing, setting out of skirting, formation of spots for skirting. (18 hrs) 50. Use of screeds, formation of curve at the junction of skirting & floor. (10 hrs)	• Floors –Types of flooring. • Flooring- materials used types. prepare method of laying, grinding & polishing of floor and prepare a survey report on materials used in flooring, site visit to check the practical techniques of flooring.(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Perform site survey with Chain/Tape and prepare the site Plan.	51. Practice of folding & unfolding of chain. (2 hrs) 52. Ranging (direct/ indirect) & distance measure with chain/ tape. (5 hrs) 53. Offset taking & entering field book. (3 hrs) 54. Chaining on sloping ground. (5 hrs) 55. Conduct a chain survey of	linear & Angular measurement by instrument i.e. Chain, tape, compass etc. • Introduction, , types of surveying, use, application principal. • Main divisions (plane & geodetic).

		a small area with all details and plotting the map. (8 hrs) 56. Calculating the area of site. (2 hrs) 57. Prepare a site plan by the help of chain / tape. (3 hrs)	Uses of Chain/ tape, testing of a chain & correction. Ranging (direct & indirect), Principle of chain survey, application. Terms used in chain survey, types of offsets, limit of offset, field book, types of field book, entry of field book, method of chaining in slopping ground. Field procedure of chain survey errors in chain survey, plotting procedure. Calculation of area (regular & irregular figure) • Knowledge of site plan. • Knowledge of Mouza Map.(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Perform the site survey using Prismatic Compass.	58. Temporary adjustment of prismatic compass. (03 hrs) 59. Measure fore & back bearing, R.B.,W.C.B. of a line. (04 hrs) 60. Measure true bearing of a line. (05 hrs) 61. Prepare a closed & open traverse using prismatic compass measure the bearings, entry into field book, calculation of correct bearing and adjust. (Local attraction), determine the closing error and adjust. Plotting the same. (16 hrs)	***Surveying:-*** **Compass survey:-** • Basic terms used in compass survey. • Instrument &its setting up. • Conversion of bearing web to R.B. • Calculation of included angle from bearing local attraction, magnetic declination and true bearing, closing error. • Adjustment of closing error, precaution in using prismatic compass. (06 hrs)
Professional Skill 28 Hrs; Professional Knowledge	Perform site survey with Plane Table and prepare a map.	62. Demonstration of instrumentused for plane table surveying & their uses (alidade, U-fork, trough compass) Set up	**Plane table survey:-** • Plane table survey, principle, merits & demerits • Instrument used in plane

06 Hrs		the plane table. (06 hrs) • Centering • Levelling • Orientation 63. Practice the method of plane tabling (14 hrs) • Radiation • Intersection • Resection • Traversing 64. Determination of height by telescopic alidade. (08 hrs)	table survey setting up the plane table. (centering, levelling, orientation) • Methods of plane table survey (radiation, intersection, resection, traversing) • Error in plane table survey.(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Prepare topography map by contours with levelling instruments.	**Levelling:- (28 hrs)** 65. Handling of levelling instruments & their settings. 66. Temporary adjustment of a level. 67. Simple levelling. 68. Differential levelling (Fly levelling). 69. Carry out Levelling field book. 70. Equate Reduction of levels Height of collimation and Rise and Fall method – Comparison of methods. 71. Solve problems on reduction of levels . 72. Calculate Missing data and fill up calculations &Arithmatical check in various problems and its solution. 73. Practice levelling with different instruments. 74. Check levelling. 75. Profile levelling or Longitudinal , plotting the	*Levelling:-* • Auto level , dumpy Level, Tilting Level - introduction, definition • Principle of levelling. • Levelling staffs, its graduation & types. • Minimum equipment required • Types,component / part and function. • Temporary and permanent adjust ment, procedure in setting up. • Level& horizontal surface. Datum Benchmark, Focussing& parallax • Deduction of levels / Reduced Level. • Types of levelling, Application to chain and Levelling Instrument to Building construction. • Contouring ;-Definition, Characteristics, Methods. • Direct and Indirect methods

		profile. 76. Surveying of a building site with chain and LevellingInstrument with a view to computing earth work. 77. Contour - Direct and Indirect methods. 78. Make Topography map, contours map. 79. Solve trigonometric problems. 80. Prepare a road project in a certain alignment.	• Interpolation of Contour, Contour gradient , Uses of Contour plan and Map. • Knowledge on road project.(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Perform a site survey with Theodolite and prepare site plan.	**Theodolite survey:- (28 hrs)** 81. Field work of theodolite. 82. Measure Horizontal angle. Vertical angle, magnetic bearing of a line. 83. Levelling with a theodolite. 84. Calculation of area from traverse. 85. Determination of Heights. 86. Calculation of departure, latitude, northing and easting 87. Setting out work-Building work, etc.	• Introduction and Types of Theodolite, • parts of Theodolite, • Terms used in Theodolite survey. • Temporary adjustment of Theodolite, • Angle measurement process. Reading of angles, field book entry of measured angles. • Permanent adjustment of Theodolite.(06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Perform a site survey with Total Station and prepare site plan.	88. Application of survey using Total Station. (2 hrs) 89. Field procedure for co ordinate measurement. (4 hrs) 90. Field procedure to run open traverse and closed traverse. (4 hrs) 91. Transfer or establish Bench Mark. (2 hrs) 92. Perform stakeout / demarcation of building layout /plot layout/	**Total Station:- –** • Introduction. • components parts, accessories used. • characteristics, features. • advantages and disadvantages. • principle of EMD. • Working and need. • Setting and measurement. • Electronic, display & Data

		roads/ alignment. (4 hrs) 93. Measure remote distance and elevation. (3 hrs) 94. Calculate surface area on field/site. (2 hrs) 95. Calculate volume of field/site. (2 hrs) 96. Procedure for down load and up load data. (1 hrs) 97. Simple survey map using Auto CAD. (4 hrs)	reading. • Rectangular and polar co-ordinate system. • Terminology of open and closed traverse. (06 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Identify timber and perform sawing and planning using hand and power tools.	98. Identify different wooden sample piece i.e.- soft wood & hard wood, wooden grains etc. & their applications Annual ring, knots, shakes &chicks etc.). (03hrs) 99. Demonstrate application of hand tools, measuring tools, and work holding devices. (04 hrs) 100. Demonstrate use of different power tools, viz. saws, drills, etc. (03hrs) 101. Perform sawing, planning,Moulding, Rebating, Chamfering, etc. using different types of saws, and plains. (15 hrs) 102. Sharpen and set different type saw bladeand planer blade/ cutter. (03hrs)	• Common Indian timbers • Defects in timber, diseases of timber, knots, shakes, grains etc. • carpentry hand tools, measuring tools and uses. • work holding devices, power tools, viz. saws, drills, etc. • Description of Carpentry Joinery, Planing, Moulding, Rebating, Chamfering, Sawing, etc.(06 hrs)
Professional Skill 28 Hrs; Professional	Demonstratesurface finish with exact sizing by planning	103. Planning face, face edge, etc. (7 hrs) 104. Demonstrate the use of marking, mortise gauge	• Type of different planes and their proper uses in wood work - Description, function and its size,

Knowledge 06 Hrs	operation	etc. (4 hrs) 105. Test the accuracy of flatness and twist-ness of the surface by using try square. (4 hrs) 106. Demonstrate the use of winding strips, cross planning, edge planning. (7 hrs) 107. Demonstrate portable power planer machine and its function. (6 hrs)	setting, knowledge of sharpening and uses etc. • knowledge of using marking gauges. • Important instruments necessary for checking flatness and twistness of surface • Sharpening and grinding angle of cutter. • Portable power planer - useful in modern wood work and new technology design. (06 hrs)
Professional Skill 56 Hrs; Professional Knowledge 12 Hrs	Prepare different wooden Joints. (Range of skill - framing joint, Housing joints, broadening joints, Lengthening joints)	Prepare different wooden joints by using different tools - 108. **Make framing joint** - Mortise and tenon Joint (Single and double, Plain hunched, Mitre corner) (16 hrs) 109. **Make Housing joints -** Full housing, Bridle, Stopped housing (10 hrs) 110. **Make broadening joints -** Simple butt joint, Riveted butt joint, etc. (15 hrs) 111. **Lengthening joints:**End half lap joint, End over lap joint, End bends lap joint,slopping scarf, racking scared, half lapping scarf , table scarf joint etc. (15 hrs)	• Description of different types joint. • Uses of joint :- Framing joint angle joint and lengthening joint, housing joint, broadening joint etc. • Wood products - Industrial forms of timber - Veneer - Laminated sheet - Fibre board - Hard board - Plywood(12 hrs)
Professional Skill 28 Hrs; Professional	Make small wooden job as per drawing with schedule sizes of	**Make small wall bracket –** 112. Make joint on hard wood to make small frame. (8 hrs)	• Calculation of timber required for Wall Bracket • List out the sequence of

Knowledge 06 Hrs	timber or alternatives of timber i.e. FRP, MDF, FOAM using various hardware.	113. Stopped Tenon & Mortise joint on hard wood in the frame to set the selves. (6 hrs) 114. Make selves by six pieces of hard wood with single lapped half lap dovetail joint with frame (two nos. of selves). (14 hrs)	operation of the job (06 hrs)
Professional Skill 56 Hrs; Professional Knowledge 12 Hrs	Make different types of doors and windows with fixing of component.	Making of :- 115. Different Types doors including panelled, glazed and flush door. (30 hrs) 116. Different types windows and ventilators. (26 hrs)	• Doors –Parts, Location, standard sizes, types. • *Windows*-types. *Ventilators*-purpose-types. (12 hrs)
Professional Skill 28 Hrs; Professional Knowledge 06 Hrs	Demonstrate joining of electrical wire and carry out soldering, crimping observing related safety precautions.	117. Prepare terminations of cable ends (02 hrs) 118. Practice on skinning, twisting and crimping. (04 Hrs) 119. Identify various types of cables and measure conductor size using SWG and micrometer. (02 Hrs) 120. Make simple twist, married, Tee and western union joints. (08 Hrs) 121. Make britannia straight, britannia Tee and rat tail joints. (08 Hrs) 122. Practice in Soldering of joints / lugs. (04 Hrs)	Electrical Wiring:- • Safety precaution and elementary first aid. • Artificial respiration and treatment of electrical shock • Elementary electricity and its units. • General ideas of supply system. • Wireman's tools kit. Wiring materials. Electrical fittings. • System of wirings. Wiring installation for domestic lightings. • Conductor, insulator,semi conductor, cable joints, measurement of cable (06 hrs)
Professional Skill 56 Hrs;	Demonstrate Electrical wiring with fixing of	123. Demonstrate different electrical wiring system with fixing of different	• Types of Fuses, MCB soldering, ELCB, RCCB, ABCB, MCCB AC and DC,

Professional Knowledge 12 Hrs	accessories conforming ISI rules (Range of skills - different types of Electrical wiring, joining of Fuses,fixing of MCB, connection of lamp with switch and different fitting, etc.)	accessories. (14 hrs) 124. Make electrical Fuse joints, fixing MCB. (04 hrs) 125. Connect lamps with switches. (06 hrs) 126. Stair case circuit wiring. (10 hrs) 127. Godown wiring. (10 hrs) 128. Hospital wiring. (12 hrs).	AC fundamentals, poly phase • types of electrical wiring • Different Electrical wiring accessories, • ISI rules of wiring • Illumination (12 hrs)
Professional Skill 56 Hrs; Professional Knowledge 12 Hrs	Demonstrate installation of electrical appliances, Earthing and estimate costing of wiring	129. Install earthing in different position. (18 hrs) 130. Install and connect electrical appliances and take reading with Voltmeter. (12 hrs) 131. Prapare materials list and costing of wiring. (10 hrs)	• Earthing, types of earthing Earthing Pit. • Different electrical appliance, accessories, Voltmeter. • Estimation and costing of wiring.(06 hrs)
	Identify different type of transformers and test and use.	132. Identify transformer, test and use. (16 hrs)	Explanation and working of different type of transformers and its classification. (06 hrs)
Professional Skill 56 Hrs; Professional Knowledge 12Hrs	Prepare a Simple pipe connection demonstrating cutting, joining of pipe with different method using different types of fittings.	133. Perform Simple pipe connection using G.I. Pipes, socket, elbow, tee, reducing elbow, G.I. union, cap plug, reducer, Three face elbow, reducing socket, plug, G.I. nipple etc. (18 hrs)	Plumbing tools, meterials used in plumbing. (04 hrs)
		Perform Joining of pipe with – 134. thread joint, (04 hrs) 135. lead joint, (04 hrs) 136. flange joint, (04 hrs) 137. cement joint, (03 hrs) 138. D. Joint etc. (03 hrs)	Different types of pipes, fittings and Joints - GI, PVC, AC,SW, CI, lead, steel - Properties and use in plumbing work(04 hrs)
		139. Perform drilling and	Method of cutting and joining

		taping on pipe. (06 hrs) 140. Fix ferrule on pipe. (04 hrs) 141. Perform Joining of pipe with Elbow joint, socket joint, Tee joint, reducing elbow joint, floor trap joint, etc. (10 hrs)	of pipes. Drills - types and uses . Tap and Dies - types and uses, calculation of Tap drill size.(04 hrs)
Professional Skill 56 Hrs; Professional Knowledge 12 Hrs	Prepare layout of soil pipe and waste pipe with different types of sanitary fittings.	142. Layout of soil pipe and waste pipe to the sanitary fitting using different types of fitting viz. Door junction, door Bend , H.R. bend, Plain Bend, Double door junction, inverter junction, cowel , floor trap, Gully trap, P-trap etc. (26 hrs) 143. Fitting of I.W.C with high level cistern. (05 hrs) 144. Fitting of washbasin (05 hrs) 145. Fitting of E.W.C. with low level cistern. (05 hrs) 146. Fitting of kitchen sink. (05 hrs) 147. Fitting of bath tub. (05 hrs) 148. Fitting of urinal pot with auto cistern. (05 hrs)	Sanitary Technical terms - sewer, sewage, sullage etc. -Soil pipe and waste pipe fitting Different types of water closets Different types of urinal port Kitchen sinks, Bath tub, Wash basin. (12 hrs)
Professional Skill 56 Hrs; Professional Knowledge 12 Hrs	Prepare a water supply system in residential buildings using different types of valves, fittings and appliances.	149. Install water meter. (08 hrs) 150. Remove air lock. (06 hrs) 151. Determination of pH by pH meter. Analysis and treatment of Effluent water. (10 hrs)	Water meter • Installation of water meter • Removal of air lock Purification of water • Mineral matter, Hardness, Causes of Scale formation &their Removal. Water

			Purification: Treatment plants for different groundwater contaminants, Treatment plants for surface water.(06 hrs)
	Create objects on 3D Modelling concept in CAD	152. Recondition taps, valves & flushing tank, test for correct functioning. (06 hrs) 153. Prepare a water supply pipe line system in residential buildings using different types of valves, fittings and appliances. (10 hrs)	Types of damages in taps , valves , water meter and tanks - Method of rectification Water supply - Sources of water Storage of water Distribution of water Different types of valves used in Plumbing, Types of tanks R.C.C., P.V.C. Iron tanks etc. (06 hrs)
		154. Prepare different objects on 3D Modelling concept in CAD. (16 hrs)	
Project Work/ Industrial Visit			

SYLLABUS FOR CIVIL ENGINEERING ASSISTANT TRADE			
SECOND YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 56 Hrs; Professional Knowledge 16Hrs	Demonstrate test and analysis of cement, aggregate, sand, effect of water cement ratio.	155. Test cement for consistency, setting times & strength. (12 hrs) 156. Conduct field tests for adulteration. (06 hrs) 157. Make proper arrangement to store cement at site. (04 hrs) 158. Perform sieve analysis on aggregate. (04 hrs) 159. Determine grading, fineness modulus. (04 hrs) 160. Determine presence of silt and clay. (04 hrs) 161. Perform test to determine shape & size of aggregate. (04 hrs) 162. Perform test to determine bulking of sand. (04 hrs) 163. Perform test and analyse the effect of water cement ratio (w/c) on strength of cement. (14 hrs)	• Definitions and terms related to concrete technology. • Applications of concrete technology and modern trends **CEMENT :** Types of cement, relevant IS codes comparative study of their physical & chemical properties, significance of different properties • Hydration of cement • Selection of cement • Storage of cement • Factors affecting strength of cement • Rejection of cement **AGGREGATE :** • Classification (IS : 383) • Grading • Characteristics (grading, fineness modules) • Bulking of fine aggregate • Deleterious substances • Factors affecting strength of concrete **WATER** • Quality • Water requirement for hydration & workability • Effect of impurities present in water **ADMIXTURE :** • Meaning of terms

			• Functions • Classification • Water proofing and permeability reducing admixture **CONSTRUCTION CHEMICALS :** • Interpretation of specifications manufactures • Meaning of terms • Functions • Classification (IS : 4082) • Water proofing and permeability reducing admixture(16 hrs)
Professional Skill 56 Hrs; Professional Knowledge 16Hrs	Prepare concrete, carry out simple form work and reinforcement with the application of modern Power Tools.	164. Prepare concrete and lay at required place using power tools. (14 hrs) 165. Carry out all operations taking necessary precautions related to from work and reinforcement. (14 hrs) 166. Test strength of concrete. (14 hrs) 167. Remove form work Properly. (14 hrs)	Preparation of concrete Methods used, merits and demerits of methods, tools and equipment used and precautions to be taken for the following processes : • Batching • Mixing • Transportation • Placing • Compaction • Curing • Finishing • Strength & durability requirements (IS : 456 - 2000) • Stripping of form work • Application of Modern Power Tools(16 hrs)
Professional Skill 112 Hrs; Professional Knowledge 32 Hrs	Prepare reinforcement of different R.C.C. members i.e. Foundation, beams, columns, slabs, Retaining Wall, etc.	168. Prepare reinforcement for foundation, beams, columns, slabs, Retaining Wall etc. (112 hrs)	• Classification & specifications of concrete • Classification of concrete according to grade, weight & methods of mixing • Ready mixed concrete, self levelling concrete, • nominal mixed and

			design mixed concrete • Properties of concrete - ✓ Workability & consistency ✓ Segregation ✓ Bleeding ✓ Strength ✓ Durability ✓ Impermeability ✓ Volume stability • R.C.C. members for foundation, beams, columns, slabs, Retaining Wall etc.(32 hrs)
Professional Skill 84Hrs; Professional Knowledge 24Hrs	Erect scaffolding and make intricate form work at different locations	169. Select appropriate material for form work at different locations. (08hrs). 170. Erect scaffolding & make form work at different locations. (66hrs) 171. Identify defects & rectify form work. (10hrs)	**Scaffolding & form work -** • Definitions of common technical terms used in Scaffolding, form work . • Types & applications • Different materials used in form work. • Methods and tools used for form work. • Safety precautions to be observed in scaffoldingand form work • Defects in form work • Deshuttering /removal of form work. • Maintenance & repair of form work • Plain cement concrete (PCC) & Reinforced cement concrete (RCC) • Properties of PCC & RCC in green state and hardened state • Importance of form work and reinforcement in construction(24hrs)

Professional Skill 84 Hrs; Professional Knowledge 24 Hrs	Prepare a bar bending schedule and demonstrate bar bending and calculate the estimated quantity of materials.	172. Prepare a bar bending schedule of different RCC members. (14 hrs) 173. Demonstrate different operations in bar bending (straightening of bars, cutting of bars, bending of bars, placing of bars, binding of bars, fixing of cover blocks). (60 hrs) 174. Estimate quantity of steel and binding wire required for a given job (10 hrs)	Bar bending • Technical terms & their meanings, Symbols, conventions used in bar bending • Specifications of material • Physical properties of reinforcing bars • Estimate the quantity of material • Structural elements & characteristics (simply supported, continuous, fixed, cantilever, overhang) • Importance of use of reinforcement in concrete • Tools used in bar bending • Correct use of tools • Different operation in bar bending (straightening of bars, cutting of bars, bending of bars, placing of bars, binding of bars, fixing of cover blocks) • Use of relevant BIS codes & tables • Guidelines for laying reinforcement.(24hrs)
Professional Skill 56 Hrs; Professional Knowledge 16 Hrs	Make different types of arches and lintels with chajja	175. Making of shuttering & supports with uprights and wedges for Arches, Lintels and Lintels with Chajjahs. (16 hrs) 176. Cutting, bending & placing of reinforcement. (12hrs) 177. Mixing, placing & compacting concrete. (06 hrs) 178. Spanning of opening with	• Arches: - Technical terms-. types ,centring • *Lintel* :-types,wooden, brick, stone, steel & RCC. Chajjas – characteristics, Centring&Shuttering.(16 hrs)

		a semi-circular arch, making centering, cutting of templates for voussoirs& preparing voussoirs, setting uprights of arch. (12 hrs) 179. Construction of arch &removing centering.(10 hrs)	
Professional Skill 84Hrs; Professional Knowledge 24Hrs	Lay out different types of vertical movement according to shape, location, materials by using stair, lift, ramp and escalator.	Layout different forms of vertical movements:- 180. As per shape - straight, open newel, dog-legged, geometrical and bifurcated stairs & spiral stairs. (30 hrs) 181. As per material - brick, wooden, steel & RCC stairs. (30 hrs) 182. Lay out of Lift and Escalator (24hrs)	• Stairs: Technical terms, relation between tread & rise, • Types of stairs, construction details of brick, stone & RCC stairs. • Spiral stairs with precast concrete steps. • Basic concept of lift and Escalator.(24hrs)
Professional Skill 56 Hrs; Professional Knowledge 16 Hrs	Explain pile foundation.	183. On site practical trainingof piling (Visit to new construction site at the time piling work or Demonstration through related video) (56 hrs)	Pile foundation • uses of piles • types of piles • materials used in the construction of load bearing piles • Factors considered in selection of piles • Pile driving & equipments used for pile driving(16 hrs)
Professional Skill 84 Hrs; Professional Knowledge 24 Hrs	Prepare a Single Storied Residential Building Plan as per local by law using CAD	184. Prepare a Single Storied Residential Building Plan as per local by law including all details Plan, Elevation, Section through Staircase and Toilet & Kitchen, Terrace Plan, Structural Plan and other details i.e. Sanitary	• Introduction about building construction Types of buildings Structural system of building. • Different parts of building • Site selection

		& Electrical items with proper symbols by using CAD. (84 hrs)	• Orientation and ventilation of building (24 hrs)
Professional Skill 28 Hrs; Professional Knowledge 08 Hrs	Demonstrate ArchiCAD and 3D Max for Solid Modelling of Architectural / Civil 3D Drawing.	185. Prepare simple drawing with ArchiCAD and 3D Max for Solid Modelling of Architectural / Civil 3D (28 hrs)	Building plans - Introduction, Types of plan- Typical floor plan, Foundation plan, Structural plan, Terrace plan.(08 hrs)
Professional Skill 28 Hrs; Professional Knowledge 08 Hrs	Prepare Solid Modelling of Architectural /Civil 3D Drawing using 3d Max and Revit software.	186. Prepare 3D model using 3d Max software (08 Hrs) 187. Create 3D model from 2D plane (08 Hrs) 188. Lighting and rendering (04 Hrs) 189. Material editor using BIM software like Revit(04 Hrs) 190. Quantity calculation of materials(04 Hrs)	• Main considerations of architectural design • Bye-law of the locality • Climate and its effects • Materials and method of its construction. • People and their requirements. (08 hrs)
Professional Skill 28 Hrs; Professional Knowledge 08 Hrs	Work out rate analysis of different item of works with detailed Specification.	191. Prepare rate analysis of different item of works including material, labour, Plant machinery, over head charge, Profit with the details specification. (16 hrs) 192. Calculation of floor area and carpet area. (08 hrs) 193. Calculation of FAR. (04 hrs)	• Steps in rate analysis • Material • Labour • Plant and machinery • Overhead charges • Profit • Specification • General and detailed specification(08 hrs)
Professional Skill 84 Hrs; Professional Knowledge 24 Hrs	Prepare a detail estimate of one room building by centre line method and separate wall method,calculate the quantities of materials involved from the	194. Estimate of one room building by center line method and separate wall method. (44 hrs) 195. Calculation of different material from the quantities worked out in the estimate.(40 hrs)	Estimating and costing Need and importance Types of estimate Items of work Measurement of items Calculation of quantities of various items (24hrs)

	above estimated quantities& prepare a abstract of cost for the above item of works.		
Professional Skill 28 Hrs; Professional Knowledge 08 Hrs	Perform repair Plastering, white washing, painting flooring, replacing of glass, repolishing of floor, stain removal from floor, wooden works.	196. Perform repairing of plaster and different items of works. (12 hrs) 197. Use of Water proofing compound, Admixture. (6 hrs) 198. Perform white washing, floor polishing,stain removal form floor, wooden works. (10 hrs)	Repair Plastering, white washing, painting flooring, replacing of glass, repolishing of floor, stain removal from floor, wooden works.(08 hrs)
Professional Skill 28 Hrs; Professional Knowledge 08 Hrs	Perform field training of Foundation failure, Strengthening of foundation, Rectification of leaking roof, repair of expansion joint.	199. Field Training to Strengthening of foundation (14 hrs) 200. Rectification of leaking roof.(7 hrs) 201. Repair of expansion joint. (7 hrs)	Special repair • Foundation failure • Strengthening of foundation • Rectification of leaking roof • Repair to expansion joint(08 hrs)
Professional Skill 28 Hrs; Professional Knowledge 08 Hrs	Demonstrate anti - termite treatment and Market survey for different materials used in anti termite treatment	202. Market survey for different materials used for anti termite treatment (06 hrs) 203. Pre construction Anti - termite treatment(10 hrs) 204. Post construction Anti - termite treatment (12 hrs)	Anti-termite treatment – objectives, materials, uses and applications. • Pre construction treatment • Post construction treatment • Weathering course – objectives and materials required.(08 hrs)
Professional Skill 56 Hrs; Professional Knowledge 16 Hrs	Layout house plumbing and drainage plan, repairing of service main, waist outlet	205. Visit to new construction site at the time laying of plumbing lines and sanitary fittings. (56 hrs)	Plumbing •Layout of house plumbing and drainage plan •Tracing leakage, repair to service main, repairing of waste outlet

	cleaning of sanitary installation, scrapping and painting of pipes of a new site.		•Cleaning of sanitary installation •Scrapping and painting of pipes(16hrs)
Professional Skill 28 Hrs; Professional Knowledge 08 Hrs	Demonstrate use of Adhesive in timber,tile fixing, jointing in concrete,joint filler & sealing compound.	206. Field Training about use of Adhesive in imber,tile fixing, jointing in concrete,joint filler & sealing compound. (28 hrs)	Adhesive and joint filler •Introduction •Types •Adhesive used in timber construction •Adhesives used in ceramic tile fixing •Adhesives used in joining concrete •Joint filler •Sealing compound(08hrs)
Professional Skill 56 Hrs; Professional Knowledge 16 Hrs	Demonstrate different types of construction equipments in Excavation, Hoisting, Conveying, Drilling.	207. Field Training(56hrs)	Construction equipments •Classification •Selection of equipments •Sources of equipments Excavation equipment •Tractor •Bull dozer •Excavator Hoisting equipment •Crane •Pulley •Cable way Conveying equipments •Belt conveyor •Rope way •Pumping equipments Drilling equipments •Types of drills •Classification of drill •Drill bits Selection of drilling pattern(16 hrs)
Professional Skill 56 Hrs; Professional	Demonstrate Construction Management i.e.	208. Visit site and training about site supervision. (20 hrs)	Construction management. Management of manpower, materials,machines with

Knowledge 16 Hrs	manpower, materials, machines and economy.	209. work to assist a civil engineer and perform as trainee Site Supervisor. (36 hrs)	economy.(16 hrs)
Project Work/Industrial Visit			

SYLLABUS FOR CORE SKILLS
1. Workshop Calculation &Science(Common for two year course) (80Hrs + 80 Hrs)
2. Employability Skills(Common for all CTS trades) (160Hrs + 80 Hrs)

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

LIST OF TOOLS & EQUIPMENT			
CIVIL ENGINEERING ASSISTANT (For batch of 24 Candidates)			
S No.	**Name of items**	**Specification**	**Quantity**
A. THEORY ROOM & DRAWING HALL			
1.	DualDesk		12Nos.
2.	DrawingBoards measuring	1250mm x900mm fixed over adjustable stand	24+1Sets
3.	Draughtsmanstoolwithback	revolvingtype	24Nos.
4.	StudentsLockers	with8compartments	3Nos.
5.	Wooden ChestofDrawers		4Nos.
6.	Steelbookcase(withlockableglassshutters)		1No.
7.	Instructor'stablewithglasstop		2Nos.
8.	RevolvingChairforClassroom		2Nos.
9.	Instructor'srevolvingwitharmchair		2Nos.
10.	Visitor's chair		2Nos.
11.	SteelAlmirah		2Nos.
12.	MagneticWhiteBoard		2Nos.
13.	Pin-upboard(withorwithoutstand)		6Nos.
14.	Workingtablesize	1250x950	2nos
15.	Tracing Table with plain glass	1250x900	1No.
B. CAD LAB			
16.	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.	24 Nos.
17.	Notebook PC		2 Nos.
18.	Drafting Software like AutoCAD, or equiv.		24 Nos.
19.	Plotter	A0 size	1 No.
20.	Laser Jet color printer	A4 size	As Required
21.	Inkjet/ Laser Jet Printer	A3 size	1 No.
22.	Color Scanner/printer with Latest Configuration		1 No.

23.	Offline UPS		As required
24.	Computer work station	module type	24 Nos.
25.	Printer Table	module type	1 No.
26.	Operator's chair		25 Nos.
27.	Instructor 's Lab table		1 No.
28.	Instructor's chair with arm		3 Nos.
29.	Book shelf with glass shutters		1 No.
30.	Air conditioner		As per requirement
31.	LAN connectivity		As per requirement
32.	Internet connection		1 No.
33.	Visualizer		1 No.
34.	Vacuum Cleaner		1 No.
C. AUDIO VISUAL AIDS			
35.	LCD Projector		1 No.
36.	Interactive Board		1 No.
D. EQUIPMENTS FOR PRACTICAL LABS			
37.	Box drawing instrument 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.		5 nos.
38.	Protractor celluloid 15 cm semi-circular.		5 nos.
39.	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.	24 Nos.
40.	Set square transparent	2 mm thick with beveled edges 45 degrees 20 cm.	24 sets.
41.	Set square celluloid	2mm thick beveled edges 60degress 20cm.	24 Nos.
42.	Drawing Board with facility of parallel bar		24 Nos.
43.	Mini drafter / T - Square		24 Nos.
44.	Erasing shield small size		5nos.
45.	Template – Architects and builders		5 nos.

46.	Pantograph		1no.
47.	Geometrical Models (wooden) as per given below		
	Cube	08 mm sides.	2 nos.
	Rectangular parallel piped	8 cm x 15 cm.	2 nos.
	Sphere	8 cm dia.	2 nos.
	Light circular core	8 cm x 15cm vertical height	2 nos.
	Square pyramid	8 cm side base and 15 cm vertical height.	2 nos.
	Cylinder	8 cm dia. 15 cm height.	2 nos.
	Prisms triangular length.	8 cm side base and 15 cm	2 nos.
	Prism hexagonal	8 cm sides hexagon and 15 cm length.	2 nos.
48.	French curves-transparent plastic set of 12.		5nos.
49.	Flexible curves	80 cm long.	5 nos.
50.	Calculator (pocket size)	1 (FX)	5nos.
51.	Proportional dividers	15 cm.	5 nos.
52.	Stencils-complete set	6 H.	2 sets
53.	Print Trimmer cutting edge	100 cm.	1 no.
E. SURVEYING INSTRUMENTS			
54.	Land measuring chain	30 mm with arms.	5 nos.
55.	Steel tape	20 meter long.	2 nos.
56.	Ranging rods wooden	2m long	24 nos.
57.	Optical square PWD pattern.		5 nos.
58.	Optical square box type circular		1 no.
59.	Off set rod.		5 nos.
60.	Steel tape	5m & 2.5 m.	1 no.
61.	Gunter's chain		1 no.
62.	Engineer's chain		1 no.
63.	Dumpy level builder	25 cm focal length x 23 mm completes with box and accessories and stand.	2 nos.
64.	Levelling staff	4 meters reading to 5mm telescopic type.	2 nos.
65.	Surveyor's umbrella.		4 nos.
66.	Spade		2 nos.
67.	Pickaxe.		2 nos.
68.	Gloves (canvas and plastic)		24 Pair each
69.	Gum boots		24 Pair
70.	Chains		3 sets

71.	Prismatic compass with stand and all accessaries		3 sets
72.	Plane tables		3 sets
73.	Auto level latest model with all accessaries		3 sets
74.	Theodolites latest model with all accessaries		3 sets
75.	Total station latest model with all accessaries		2 sets
F. CARPENTRY LAB			
76.	Flexible tape role steel	3 meter	24 Nos.
77.	Try Square	20 mm	24 Nos.
78.	Square bevel		24 Nos.
79.	Marking Gauge	Wooden	24 Nos.
80.	Hand Saw	450 mm	24 Nos.
81.	Saw tenon	300 mm	24 Nos.
82.	Jack plane metal	335 mm X 50 mm cutter	24 Nos.
83.	Plane smoothing metal	250 mm X 50 mm cutter	24 Nos.
84.	Chisel firmer (bevel edge)	6, 10, 15, 20, 25mm with (5 nos.)	24 Nos.
85.	Chisel mort ice	6,10,15,	24 Nos.
86.	Screw driver	300 mm	24 Nos.
87.	Wooden mallet	medium size	24 Nos.
88.	Hammer claw	500gms	24 Nos.
89.	Carborandom stone	200x 50x 25mm	24 Nos.
90.	Hand brush for bench cleaning	400mm	24 Nos.
91.	Screw Driver	250 mm	24 Nos.
92.	Pincer	50mm	5 No.
93.	File Half Round 2nd Cut	250mm	12 Nos.
94.	File half wood rasp bastard	300mm	12 Nos.
95.	File slim taper	100 mm	12 Nos.
96.	Card File (Steel) wire brush for file		12 Nos.
97.	Electrically operated motorized		cutter 5 Nos.
98.	Boring tools		1 set
99.	Fastenings		1 set
100.	Hinges and locks		1 set each
G. PLUMBING LAB			
101.	Steel Rule	300 mm both in inch and mm	25 Nos.

102.	Hacksaw frame adjustable	250 to 300 mm	25 Nos.
103.	Chisel cold flat	20 x 250 mm	25 Nos.
104.	Hammer ball peen	800 gms.	25 Nos.
105.	File flat rough	300 mm	25 Nos.
106.	Level spirit wooden	300 mm	25 Nos.
107.	Plumb bob	50 gms.	25 Nos.
108.	Stilson wrench	200 & 350 mm	25 Nos.
109.	Wooden mallet small		25 Nos.
110.	Cutting pliers		25 Nos.
111.	Chisel cold flat	20 mm x 300 mm	2 Nos.
112.	Tap and die set to cut BSP Thread		1 set.
113.	Spanner monkey	up to 50 mm	2 Nos.
114.	Cutter, pipe wheel type	6 mm to 25 mm.	1 No.
115.	Inside caliper	150 mm	5 Nos.
116.	Caliper outside	15o mm	5 Nos.
117.	Plumbers ladle		2 Nos.
118.	Plumbers metal melting pot	10 kg.	1 No.
119.	Pipe vice to grip pipes up to	77 mm.	2 Nos.
120.	Tool caulking	set of 2	2 Sets
121.	Stillson pattern pipe wrenches	450 mm to take pipe up to 52 mm dia.	2 sets
122.	Stillson pattern pipe wrenches	300 mm to take pipe to 20 mm to 32 mm.	2 sets
123.	Chain pipe wrenches	90 mm-650 mm	2 sets
124.	Flat Smithy tong.		2 Nos.
125.	Working Bench	24oox 1200 x 750 mm	2 Nos.
126.	Ratchet rack	with post and clamp flat 5 drill 6 to 35 mm by 0.2 mm.	1 Set
127.	Ratchet pipe die	15 mm to 32 mm	2 No.
128.	Double face hammers		5 Nos.
129.	Monkey Plier (gas pliers)		5 Nos.
130.	Electric handling machine	6 to 35 mm by 0.2 mm. for drilling	1 No.
131.	Trowel 125		2 Nos.
132.	Saw plumber	300 mm	2 Nos.
H. ELECTRICAL LAB			
133.	Rule wooden	4 fold 60 mm	24 Nos.
134.	Scriber	150 mm (Knurled Centre position)	24 Nos.
135.	Pincer	150 mm	24 Nos.
136.	Plier insulated	150 mm	24 Nos.

137.	Screw driver	150 mm	24 Nos.
138.	Punch Centre	150 mmx 9 mm	24 Nos.
139.	Knife double bladed electrician		24 Nos.
140.	Hammer, cross pane	115 grams with handle	24 Nos.
141.	Electrician connector, screw driver	100 mm. Insulated handle thin stem	24 Nos.
142.	Electrician testing pencil	I I neon Tester	24 Nos.
143.	Heavy duty screw driver	200 mm	24 Nos.
144.	Electrician screw driver	250 mm thin stem insulated handle	24 Nos.
145.	Saw tenon	250 mm	24 Nos.
146.	Hammer ball pane	0.75 kg with handle	24 Nos.
147.	Firmer chisel	wood 12 mm	24 Nos.
148.	Gimlet	6 mm	24 Nos.
149.	Bradawl		24 Nos.
150.	Plier sued cutting	150 mm	24 Nos.
151.	C. Clamps	200 mm, 150 mm, 100 mm	2 Nos.
152.	Spanner	150 mm adjustable 15 degree as cly-burns	2 Nos.
153.	Blow lamp	0.5 liter	2 Nos.
154.	Melting pot		1 No.
155.	Ladder		2 Nos.
156.	Chisel cold flat	12 mmx 200 mm	2 Nos.
157.	Chisel firmer	25 mm and 6 mm	4 Nos.
158.	Drill machine hand	0 to 6 mm capacity	2 Nos.
159.	Electric drill machine	12 mm capacity	1 No.
160.	Out side micrometer	0 to 25 mm	1 No.
161.	Bench grinder motorized		1 No.
162.	Raw plug tool and bit		2 Nos.
163.	Bearing puller		1 No.
164.	Multi meter	0 to 1000 M ohms 2.5 to 5000 volt	2 Nos.
165.	K.W. meter.	0 to 1 K.W. capacity with C.T.1: 2	1 No.
166.	Milli voltmeter Centre	zero 100-0-100m volt.	1 No.
167.	Spring balance	0 to 15 kg. And 0 to 2.5 kg.	2 Nos.
168.	Screw driver	100 mm	5 Nos.
169.	Square try	150mm blade	5 Nos.
170.	Divider	150 mm, out side and inside caliper	4 Nos.
171.	Tweezers	100 mm.	5 Nos.

172.	Snip straight	150 mm	2 Nos.
173.	File flat	200 mm 2nd cut	3 Nos.
174.	File half round	200 mm 2nd cut	5 Nos.
175.	File half round	200 mm smooth	5 Nos.
176.	File round	200 mm 2nd cut	5 Nos.
177.	File flat	250 mm rough	5 Nos.
178.	File flat	250 mm bastard	5 Nos.
179.	Rasp, half round	200 bastard	5 Nos.
180.	Iron, soldering	225 grams 125 watt with bits	5 Nos.
181.	Vice hand	50mm jaw	5 Nos.
182.	Megger	500 volts	1 No.
183.	Fan A.C.	230 volt 1200 mm	2 Nos.
184.	Fan D.C.	220 volt 1200 mm	2 Nos.
185.	Bench working	2.5x 1.20x 0.75 meters	5 Nos.
186.	Almirah	2.5x1.20x0.50 meter	1 No.
187.	Metal rack	180x150x47 cm.	5 Nos.
188.	Wire stripper	20 cm.	1 No.
189.	Domestic appliances: (a) Electric hot plate	1500 watt. 220v with temperature control.	2 Nos.
	(b) Electric kettle,	1000 watts, 230v	2 Nos.
	(c) Electric iron	1200 watts, 230v with temperature control.	2 Nos.
	(d) Immersion heater	750/1000/1500w-230v	2 Nos.
	(e) Geyser	25 liter 240v (storage type)	2 Nos.
	(f) B.A. taps and dies	0-2-4-6-8 sizes	2 Nos.
	(g) Mixture grinder		2 Nos.
190.	Spring balance	0 –1 kg.	1 No.
191.	Motor A.C. series type	230 v, 50 cycles, ¼ HP with starter and switch	1 No.
192.	Multi meter digital		12 Nos.
193.	Motor AC single phase	230 volt, 50 cycles capacitor type with starter switch 1HP	1 No.
194.	Motor universal	230 volt, 50 cycles with starter/switch 1 HP	1 No.
195.	Variable auto transformer	0-250 V, amps	2 Nos.
196.	Earth leakage ckt. Breaker		1 no.
197.	M.C.B. 5 KVA		1 no.
198.	Voltage stabilizer manual and automatic		1 no. Each

199.	Multi meter		3 sets
200.	Meger		2 sets
201.	Earth tester		2 sets
202.	Electric tool kit		4 sets
203.	Multi meter		3 sets
FOR BUILDING CONSTRUCTION LAB			
204.	Measuring tape	15 mtr. (steel)	4 nos.
205.	Land measuring steel tape	30 mt long	12 Nos.
206.	Land measuring plastic tape	30 mt long	12 Nos.
207.	Steel tapes	3 mt long	24 Nos.
208.	Steel tapes	5 mt long	24 Nos.
209.	Try square		4 Nos.
210.	Marking point		4 Nos.
211.	Tenon saw, dovetail saw		4 each
212.	Chiesel	different suitable sizes	4 sets
213.	Hammer	500 gm.	4 Nos.
214.	Hammer	1 kg.	4 Nos.
215.	Hammer	5 kg.	4 Nos.
216.	Bar bending table		4 Nos.
217.	Bending pipes (suitable diameter and length)		2 each
218.	Bar bending lever (suitable diameter and length)		2 sets
219.	Manual bar bending machine of suitable size		2 Nos.
220.	Portable hand bender of suitable size		2 Nos.
221.	Power cutter of suitable size		2 Nos.
222.	Safety gloves		8 pairs
223.	Safety glass		8 pairs
224.	Shovel		5 Nos.
225.	M.S pan	45 cm dia.	12 Nos.
226.	Farma of mild steel for measuring aggregate	Heaving volume 0.03472 cm	2 No.
227.	Bucket G.i.	35 cm dia.	5 No.
228.	Mason plumb rule with spirit level		24 Nos.
229.	Mason square	30x60 cm	24 Nos.
230.	Sieve for sand in adjustable stand	1mm, 100cm x 60cm fixed in steel frame	2 No.
231.	Trowel	25 cmx10cm	16 Nos.
232.	Brick hammer with handle		12 Nos.
233.	pointing Trowel	6”	24 Nos.

234.	Line pin corner block		24 Nos.
235.	Mortar board	2 mtx2 mt.	2 No.
236.	Wire brushes		12 Nos.
237.	Float wooden		24 Nos.
238.	Steel float		24 Nos.
239.	Sprit level	30 cm long	12 Nos.
240.	Bolster		12 Nos.
241.	Spade		12 Nos.
242.	Ladder aluminium	3m long	3 Nos.
243.	Pick axe		5 Nos.
244.	Hammer	250 grams	12 Nos.
245.	Crow bar	30mm dia 1.5 m long of mild steel	6 Nos.
246.	Gloves canvas		12 Pair
247.	Gloves plastic		12 Pair
248.	Drums	200 liters capacity	2 Nos.
249.	Brush for painting & white washing		As required
250.	Marking rope & thread	15 m	64 each
251.	Bevel		8 Nos.
252.	Pan (M.S. or PVC)		16 Nos.
253.	Mortar board	2000 x 2000	2 Nos.
254.	Measuring box	35 ltr. Capacity	4 Nos.
255.	Plumb rule and Bob		8 Nos.
256.	Straight edge		8 Nos.
257.	Water tube	6 m	8 Nos.
258.	Bucket	5 ltr. & 10 lrt.	8 each
259.	Concrete mixer		2 Nos.
260.	Concrete vibrator	pin type & plate type	2 each
261.	Water drum	200 ltr.	4 Nos.
262.	Mono block pump set	1/2 HP	4 Nos.
263.	Steel / plywood shuttering plates		50 sqm.
264.	Telescopic pipes / props		100 Nos.
265.	Telescopic/ adjustable spans		25 Nos.
266.	Masonry grinder		2 Nos.
267.	Scientific calculator		16 Nos.
268.	Weighing balance	1 kg., 10 kg. Digital	2 each
269.	Bristle brush	25 & 40 mm with 250 handle	2 each
270.	Vicat apparatus with plunger, needles and mould		2 set
271.	Stop watch		8 Nos.

272.	Gauging trowel		4 Nos.
273.	Digital compression testing machine		1 No.
274.	Cube mould	150 mm size	24 No.
275.	Cube mould	70.5mm size	10 Nos.
276.	Measuring cylinder	100 ml., 500 m., 1000 ml.	4 each
277.	Non porous plate		16 Nos.
278.	Water container	1000 ltr.	1 No.
279.	Vibrating machine	12000 ± 400 rpm	2 set
280.	Graduated cylinder		8 Nos.
281.	Metal tray		8 Nos.
282.	Beaker		8 Nos.
283.	Oven		1 No.
284.	Weighing plateform digital	100 kg.	1 No.
285.	Slump test apparatus with temping rod		2 set
286.	Electronic balance	30kg – 1gram L.C	1 No.
287.	IS Brass sieves -	4.75mm,2.36mm, 1.18mm, 600micron, 300 micron, 150 micron, 90 micron, 75 micron, 45micron, pan and cover	1 each
288.	Motorised sieve shaker		1 No.
289.	Thickness and length gauges (Elongation and Flakiness Index)		1 each
290.	Pyconometer for specific gravity		2 Nos.
291.	Bulk density apparatus (Cylindrical measure for fine aggregate and coarse aggregate)		1 No.
292.	Aggregate impact tester with cylindrical cup and measuring cylinder		1 No.
293.	Sample tray- steel and plastic	300x250x40mm	12 Nos. each
294.	Mortar cube vibrator	12000±400rpm	1 No.
295.	Standard IS sand	Grade 1, Grade 2, Grade 3	2 bagseach
296.	Water testing kit – for ph value		2 Nos.
297.	Electric heater		1 No.
298.	Le Chatelier Mould (for soundness test of cement)		1 No.
299.	Le Chateliers flask (For specific gravity test of cement)		1 No.
300.	Slump Cone		1 No.
301.	Marking rope & thread	15 m	64 each
302.	Pan	M.S. or PVC	16 Nos.

303.	Sampling scoops	2kg and 5 kg	3 Nos.each
304.	Drill and bit set		3 Nos.each
305.	Spray painting machine		1 No.
306.	Brushes for painting		12 Nos. each
307.	Floor polishing machine		1 No.
308.	Spanner monkey	up to 50 mm 1	12 Nos.
309.	Stillson pattern pipe wrenches	450 mm to take pipe up to 52 mm dia.	2 Nos.
310.	Adjustable spanner	A 375	12 Nos.
311.	Double face hammers		12 Nos.
312.	Screw driver Set		12 Nos.
313.	Floats	wooden	8 Nos.
314.	Wire brushes		8 Nos.
315.	Ladder	3m	8 Nos.
316.	Aluminum float		8 Nos.
317.	Tile cutter	hand operated	4 Nos.
318.	Power operated cutting machine		4 Nos.
319.	Wooden mallet		8 Nos.
320.	Polishing machine		1 No.
321.	Polishing stone	different grade / number	8 set
322.	Bending pipes	suitable dia& length	2each

Note: -

1. *All the tools and equipment are to be procured as per BIS specification.*

ANNEXURE-II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum.

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

List of Expert Members contributed/ participated for finalizing the course curriculum of Civil Engineering Assistant trade at CSTARI, Kolkata			
S No.	**Name & Designation Sh/Mr/Ms**	**Organization**	**Remarks**
1.	B.V.S.Seshachari, Director	CSTARI, Kolkata	Chairman
2.	Mohinimohan Pal Instructor	Govt. ITI, Siliguri, Kolkata – 40	Member
3.	L. K. Mukherjee Dy. Director of Trg.	CSTARI, Kolkata	Member
4.	Nirmalya Nath Asst. Director of Trg.	CSTARI, Kolkata	Member
5.	Prasoon Kr. Ghosh, Sr. Draughtsman	CSTARI, Kolkata	Member
6.	R.N.Manna, Training Officer	CSTARI, Kolkata	Member

S No	**Name of the members of Sector Mentor Council with Designation and Representing organisation**	**Remarks**
1	Mr. G.M. Rao Chairman GMR Infrastructure IBC Knowledge Park, Phase 2, "D" Block, 9th Floor, 4/1, Bannerghatta Road, Bangalore - 560 029,Karnataka	Nominated by Federation of Indian Chambers of Commerce and Industry (FICCI)
2	Mr. Jasmeet Singh Head-Customer Experience Program JCB India, 23/7 Mathura Road Ballabgarh, Faridabad, Haryana 121004	Nominated by Federation of Indian Chambers of Commerce and Industry (FICCI)

3	Mr. C.S. Gupta Secretary Indian Plumbing Association E - 117, L.G.F. Greater Kailash - 3 Masjid Moth, NEW DELHI – 110 048	
4	MrAjitGulabchand Chairman HCC Chairman Construction SSC Hindustan Construction Co. Ltd. Hincon House, 247 Park LBS Marg, Vikhroli (W), Mumbai - 400083	
5	Mr. SatishGottipati M/s Precca Solutions India Pvt. Ltd. Plot No 6, D. No. 2-9/5/6 VenkatSai Gateway, Green Land Colony, Hyderabad-500032	Nominated by Federation of Indian Micro and Small & Medium Enterprises (FISME)
6	Dr. AnjanDutta Professor Dept. of Civil Engg. Indian Institute of Technology Guwahati Guwahati 781039, Assam, India	Nominated by Indian Institute of Technology, Guwahati
7	Dr. Mahendra Singh Professor Indian Institute of Technology Roorkee Roorkee, Uttarakhand, India - 247667	Nominated by Indian Institute of Technology, Roorkee
8	Pr. S.C. Dutta Professor Indian Institute of Technology Bhubaneswar Bhubaneswar-751 013	Nominated by Indian Institute of Technology, Bhubaneswar
9	Dr. Rajesh Deoliya Principal Scientist, CSIR-CBRI Extension Centre Zone 6, II nd Floor India Habitat Centre, Lodhi Road, New Delhi 110003	Nominated by Central Building Research Institute (CBRI), Roorkee
10	Dr. N. Dhang Professor, D/o Civil Engineering Indian Institute of Technology Kharagpur Kharagpur, India - 721302	Chairman
11	Dr. P. SitapatiRao Additional Director General National Academy of Construction NAC Grounds, Cyberabad, Hyderabad-500084,Andhra Pradesh, India	Nominated by National Academy of Construction, Hyderabad
12	Dr. Koshy Varghese Professor, D/o Civil Engg,	Nominated by Indian Institute of Technology, Madras

	Indian Institute of Technology Madras, IIT P.O., Chennai 600 036	
13	Shri M.C. Sharma, Jt. Director (TTC)	Mentor
14	Shri.R.N. MANNA, TO	Representative of CSTARI
15	Shri. GOPALKRISHNAN, TO	Representative of NIMI
16	Smt. ARPANA SINGH, TO, NVTI NOIDA	Champion Master Trainer
17	Shri. S.RANA, TO, ATI, Kolkata	Member
18	Shri.S.R. VHATKAR, TO, ATI, Kolkata	Member
19	Shri, T.K. BHATTACHARYA, TO, ATI, Hyd	Member
20	Shri.P.K. MADAVI, TO, CTI, Chennai	Member
21	Smt. Surya Kumari, TO, RVTI Kolkata	Member
22	Shri. C.T. SHANTILAL, VI, ATI, Calicut	Member
23	ShriDevasariGanesh,TO, RVTI Mumbai	Member
24	Shri K.N. Babu, TO, RVTI, Bangalore	Member
25	Shri. D.K. Chattopadhyay, TO, ATI Kolkata	Member
26	Shri. Chockalingam, TO, CTI, Chennai	Member
27	Smt. Brahmeswari, TO, RVTI(W), Bangalore	Member
28	Shri. K V Suresh, Principal, ITD, Kerala	Member
29	Shri. Musthfa V M, Sr. Instructor, ITD, Kerala	Member
30	Shri. Madhusudhanan C, Sr. Instructor, ITD, Kerala	Member
31	Shri. Suresh S, Sr. Instructor, ITD, Kerala	Member
32	Shri. R Sundar, ATO, Govt. ITI, Channai	Member
33	Smt. Amrutha, VI, RVTI(W), Bangalore	Member
34	Smt. HariChandana Devi, VI, RVTI(W), Panipat	Member
35	Ms. AswathyPrabhakaran, VI, RVTI(W), Bangalore	Member
36	Shri. Sugesh K, Jr. Instructor, ITD, Kerala	Member

ABBREVIATIONS

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्