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

COMPETENCY BASED CURRICULUM

DRAUGHTSMAN CIVIL

(Revised in 2017)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 5

SECTOR – CONSTRUCTION

DRAUGHTSMAN CIVIL

(Revised in 2017)

Version: 2017.1

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

EN-81, Sector-V, Salt Lake City,

Kolkata – 700 091

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

List of expert members participated for finalizing the course curricula of DRAUGHTSMAN (CIVIL) trade held on 13th January'2017 at CSTARI, Kolkata			
SL. No.	**Name of the member with Designation**	**Representing organisation**	**Remarks**
1.	DEEPANKAR MALLICK, Dy. Director General (Trg.)	DGT, MSDE, New Delhi	Chairman
2.	H. V. SAMVATSAR, Director	CSTARI, Kolkata	Member
3.	PARTHA SARKAR, Jr. Engineer/Drawing (Mech.)	Railway Workshop, Kanchrapara	Member
4.	Tushar Bagchi, Principal	Skill Training Institute, Larsen & Tubro, kolkata	Member
5.	DEEPAK KUMAR, SSE/Drg./C&W	Railway Workshop, Kanchrapara	Member
6.	Chanchal Chakraborty, AGME (Civil)	Airport Authority of India, Netaji Subhas Chandra Bose International Airport, Kolkata	Member
7.	SUNIRMAL BASU, Asst. Inspecting Officer	Railway Workshop, Kanchrapara	Member
8.	CHIRANJIB PATITUNDI Asst. Engineer (Civil)	BHEL – PSER, Salt Lake, Sec – II	Member
9.	MILAN DUTTA Instructor	Govt. ITI Gariahat, Kolkata – 19	Member
10.	UPENDRA KUMAR MALLICK Dy. Director	DTE&T, Odisha	Member
11.	N. R. PATTANAIK Principal	Govt. ITI Balasore, Odisha	Member
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15.	D. W. PATNE, Secretary/Principal	Association of Non Govt. ITI, Maharastra	Member
16.	R. N. BADYOPADHYAYA Chairman	Board of Studies & Skill, WBSCT&VE&SD	Member
17.	SANJAY KUMAR Joint Director of Trg.	CSTARI, Kolkata	Member

18.	L. K. MUKHERJEE Dy. Director of Trg.	CSTARI, Kolkata	Member
19.	NIRMALYA NATH Asst. Director of Trg.	CSTARI, Kolkata	Member
20.	Brindaban Das Asst. Director of Trg.	CSTARI, Kolkata	Member
21.	RANADIP MITRA Manager (HRD)	GRSE Ltd., Kolkata	Member
22.	Prasoon Kr. Ghosh, Sr. Draughtsman	CSTARI, Kolkata	Member
23.	R.N.Manna, Training Officer	CSTARI, Kolkata	Member

SL.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)
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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	Shri Devasari Ganesh,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. Hari Chandana Devi, VI, RVTI(W), Panipat	Member
35	Ms. Aswathy Prabhakaran, VI, RVTI(W), Bangalore	Member
36	Shri. Sugesh K, Jr. Instructor, ITD, Kerala	Member

CONTENTS

1. COURSE INFORMATION

During the 02 years duration a candidate is trained on subjects viz. Professional Skill, Professional Knowledge, Workshop Science & Calculation and Employability Skills. 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, drawing of roads, bridges, railway tracks, dams and Estimation and costing of civil works at the end of the course.

The broad components covered under Professional Skill subject are as below:

Semester-I: The practical part starts with basic drawing (consisting geometrical figure, symbols & representations). Later the drawing skills imparted are drawing of different scales, projections, drawing of shoring, scaffolding, stone and brick masonry, foundation, damp proofing, arches / lintel etc. 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.

Semester -II: Different site survey (using Chain & tape, Prismatic compass, Plane table, Levelling instrument, Theodolite), field book entry, plotting, mapping, calculation of area, Drawing of carpentry joints and Electrical wiring, drawing of floors, slabs, vertical movements (viz.stair, lift well, ramp and escalator), drawing of different types of roof truss are being taught in the practical.

Semester -III: Single storied building plan in traditional drawing. Knowledge and application of Computer Aided Drafting. Workspace creating drawing using toolbars, commands, and menus. Plotting drawing from CAD. 2D drafting of Doors, Windows, hand railing, wash basin, and plumbing joints. Preparing library folders by creating blocks of regularly used items. Preparation of a sanction plan of double storied RCC flat roof residential building using CAD. Preparation of a drawing of public building by framed structure using CAD. Preparation of Bar bending schedule. Drawing of different steel structure joints using CAD. Detail drawing of sanitary fittings and sewerage arrangements using CAD.

Semester -IV: Detail and sectional drawing of Roads, Bridges, culverts, railway tracks and embankment, Dams, Barrages, Weir and cross drainage works using CAD, schematic diagram of hydro electric project using CAD, Estimating and Cost analysis of different types of buildings and structures, preparation of map using Total Station and location of station point using GPS are being performed as part of practical training.

Professional Knowledge subject is simultaneously taught in the same fashion to apply cognitive knowledge while executing task.

Options for employment are: -

Employment opportunities for trainee from this trade as Draftsman, Surveyor and Land Surveyor shall be available in Central & State Government Departments.

Private sector opportunities shall be as Draftsman, Construction Supervisor with Architect, Civil Engineer, and Civil Contractor, Builders.

Options for self-employment are:

The Trainee shall be able to independently undertake planning, drawing, estimation & costing and supervision of civil construction work. He can set up his own office for above work and also to supply Civil Construction materials.

2. TRAINING SYSTEM

2.1 GENERAL

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

Draughtsman Civil trade under CTS is one of the most popular courses delivered nationwide through network of ITIs. The course is of two years (04 semester) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional skills and knowledge, while Core area Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skill & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Trade Certificate (NTC) by NCVT having worldwide recognition.

Candidates need broadly to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
- Perform 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 CAREER PROGRESSION PATHWAYS:

- Can appear in 10+2 examination through National Institute of Open Schooling (NIOS) for acquiring higher secondary certificate and can go further for General/ Technical education.
- 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 instructor in ITIs.

2.3 COURSE STRUCTURE:

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

	COURSE ELEMENTS	HOURLY DISTRIBUTION
A	PROFESSIONAL SKILL(Trade Practical)	2436 HRS
B	PROFESSIONAL KNOWLEDGE(Trade Theory)	510 HRS
C	WORKSHOP CALCULATION & SCIENCE	168 HRS
E	EMPLOYABILITY SKILLS	110 HRS
F	EXTRA CURRICULAR ACTIVITIES/LIB.	136 HRS
G	INPLANT TRG./PROJECT WORK	320 HRS
H	REVISION & EXAMINATION	480 HRS
	TOTAL	4160 HRS

2.4 ASSESSMENT & CERTIFICATION:

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

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

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

2.4.1 PASS REGULATION

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

2.4.2 ASSESSMENT GUIDELINE

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

Assessment will be evidence based comprising the following:

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

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

Performance Level	Evidence
(a) Weightage in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate with occasional guidance and showing due regard for Govt. Bye Laws, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of drawing instruments and equipment • Below 70% dimensional 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 above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for Govt. Bye Laws, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of drawing instruments and equipment • 70-80% dimensional 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 above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for Govt. Bye Laws has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of drawing instruments and equipment • Above 80% dimensional 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.

3. JOB ROLE

What Do Draftsmen Do?

Draftsmen, also called drafters, perform some of the same tasks as architects and often work with architects. Draftsmen, like architects, prepare CAD drawings. However, drafting can be applied to many other areas besides construction and architecture. Drafting can be used to create drawings of circuitry or mechanical designs. A draftsman's CAD drawings include technical details and specifications such as materials, dimensions and procedures. In addition to using CAD, draftsmen also use calculators, tables and technical handbooks.

The type of work a draftsman does depends on his or her area of expertise. For example, drafters produce drawings for new construction projects. They may specialize in residential or commercial buildings or in the type of material used, such as steel, timber or reinforced concrete. Civil drafters prepare drawings for use in major civil engineering projects, such as highway and bridge construction, sewage systems and flood-control projects.

Draftsmen are responsible for creating technical drawings that accurately represent design ideas. Draftsmen use hand drawing and computer-aided drafting methods to generate precise drawings that meet given specifications and are used by manufacturers, builders and engineers.

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

Job Duties and Tasks for: "Civil Drafter"

1) Produce drawings using computer assisted drafting systems (CAD) or drafting machines or by hand using compasses, dividers, protractors, triangles and other drafting devices.

2) Draft plans and detailed drawings for structures, installations, and construction projects such as highways, sewage disposal systems, and dikes, working from sketches or notes.

3) Draw maps, diagrams, and profiles, using cross-sections and surveys, to represent elevations, topographical contours, subsurface formations and Structures.

This course is meant for the candidates who aspire to -

1. Use and maintain in good condition- drawing instruments, slide rule ,survey instruments, auto level , digital theodolite , total station, GPS, computer & drafting software, plotter & printer etc.
2. Plan and draw of residential buildings from given data.
3. Prepare working drawings of all types of buildings from line sketches in CAD.
4. Planning, drawing, estimating, and costing of civil work. Drawing plans by using CAD. Making of 3D models of civil work. Giving setting out of site, supervision of civil work etc.
5. Prepare proposals for drainages and water supply for a given building including preparation of detailed drawings.
6. Plot the longitudinal section and cross-section for a proposed road and calculate the earth work and materials for road work.
7. Draw the parts of R.C.C. structures and steel sections. Prepare working drawing of R.C.C. structures from the given field data
8. Draw from sketches or specifications various types and cross-section of roads culverts,bridges Railways & irrigation structures in CAD
9. Carry out the surveying by using latest equipments.(Auto level, Digital theodolite,Total station, GPS)

N.C.O Code No. 3118.20 Draughtsman, Civil prepares drawings of buildings, stores , high ways, dams, culverts, etc. from sketches, notes or data for purposes of construction or alternations. Takes instructions form Civil Engineer studies sketches and calculates dimensions from notes or data. Draws to given scale different elevations, plan, sectional views etc. of desired construction using drawing instruments. Draws detailed drawings of specific portions as required. Indicates types of materials to be used, artistic and structural features, etc. in drawing as necessary. May do tracing and blue printing. May reduce or enlarge drawings. May prepare or check estimate schedules for cost of materials and labour. May prepare tender schedules and draft agreements. May work as Draughtsman Architectural.

N.C.O Code No. 3118.50 Draughtsman, Structural prepares drawings of bridges, steel structures, roof tresses etc. from sketches, designs or data for purposes of construction,

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

N.C.O Code No. 3118.60 Draughtsman, Topographical Sketches topographical drawings to scale in different colours using blue print prepared from field plane tables. Carries out independently projection of small scale map to predetermined size, incorporating features covered in survey, producing total geographical effect by hill shading, giving contours, profile, cross sections, authorized symbols, etc. Uses grid tables, projection table compasses, pantograph, planimeter, etc.

Options for employment are: -

Employment opportunities for trainee from this trade as Draftsman, Surveyor and Land Surveyor shall be available in Central & State Government Departments.

Private sector opportunities shall be as Draftsman, Construction Supervisor with Architect, Civil Engineer, and Civil Contractor, Builders.

Options for self-employment are:

The Trainee shall be able to independently undertake planning, drawing, estimation & costing and supervision of civil construction work. He can set up his own office for above work and also to supply Civil Construction materials.

4. NSQF LEVEL COMPLIANCE

NSQF level for Draughtsman civil under CTS: **Level 5**

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

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

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

a. Process
b. professional knowledge,
c. professional skill,
d. core skill and
e. Responsibility.

The Broad Learning outcome of Draughts man civil trade under CTS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

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

5. GENERAL INFORMATION

1. **Name of the Trade** : **DRAUGHTSMAN CIVIL**
2. **N.C.O. Code No.** : 3118.20, 3118.50, 3118.60
3. **NSQC Level** : Level - 5
4. **Duration of Craftsmen Training:** Two years (Four semesters each of six months duration).
5. **Entry Qualification** : Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
6. **Trainees per unit** : 20 Trainees
7. **Space Norms** : **a) Class room: 30 sqm.**
   b) Drawing lab: 90 sqm.
   c) Computer lab: 50 sqm.
8. **Power Norms** : **a) Class room: 1kw (6000 lumen)**
   b) Drawing lab : 2 kw (30,000 lumen)

7**. Instructor's/Trainer's Qualification**

1. Draughtsman Civil Trade	Degree in Civil Engineering from recognized Engineering College /university with one year experience in the relevant field. OR Diploma in Civil Engineering from recognized board of technical education with two years experience in the relevant field. OR 10th Class Pass + NTC/NAC in the Trade of "Draughtsman Civil" With 3 years post qualification experience in the relevant field. **Desirable: -** Preference will be given to a candidate with CIC (Craft Instructor Certificate) in Draughtsman Civil trade. ***Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.***
2. Workshop Calculation & Science	Degree in Engineering with one year experience. OR Diploma in Engineering with two years experience. Desirable: Craft Instructor Certificate in RoD & A course under NCVT.

3. Employability Skill	MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGT institutes. AND Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above. **OR** **Existing Social Studies Instructors duly trained in Employability Skills from DGT institutes**
List of Tools and Equipment	As per Annexure – I

Distribution of training on Hourly basis: (Indicative only)

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Employability skills	Extra-curricular activity
40 Hours	28 Hours	6 Hours	2 Hours	2 Hours	2 Hours

6. LEARNING/ ASSESSABLE OUTCOME

The following are minimum broad learning outcome after completion of the Draughts man civil course of 02 years (Four Semester) duration:

A. GENERIC LEARNING OUTCOME

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.
3. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, statistics, co-ordinate system and apply knowledge of specific area to perform practical operations.
4. Read and apply engineering drawing for different application in the field of work.
5. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
8. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.
9. Understand and apply management of workers, communications and team management skills.

B. SPECIFIC LEARNING OUTCOME

SEM-I

10. Draw in free hand sketches of hand tools used in civil work.
11. Draw plane figure applying drawing instruments with proper layout and the method of folding drawing sheets.
12. Construct plain scale, comparative scale, diagonal scale and vernier scale.
13. Draw orthographic projections of different objects with proper lines, lettering and dimensioning.
14. Draw Isometric / Oblique / Perspective views of different solid / hollow / cut sections with proper lines, lettering and dimensioning.
15. Draw component parts of a single storied residential building with suitable symbols and scales.
16. Draw different types of stone and brick masonry.
17. Draw different types of shallow and deep foundation.
18. Draw different types of shoring, scaffolding, underpinning, framework and timbering.
19. Draw different types of Damp proofing in different position.
20. Drawing of different types of arches and lintels with chajja.

SEM-II

21. Perform site survey with chain / tape and prepare site plan.
22. Perfom site survey with prismatic compass and prepare site plan.
23. Perform site survey with plane table and prepare site plan.
24. Make topography map / contour map with leveling instrument.
25. Perform site survey with Theodolite and prepare site plan.
26. Drawing of different types of carpentry joints
27. Draw different types of doors and windows according to manner of construction, Arrangement of component, and working operation.
28. Prepare the detailed drawing of electrical wiring system.
29. Draw types of ground and upper floors.
30. Draw different types of vertical movement according to shape, location, materials in stair, lift, ramp and escalator.
31. Draw different types of roofs according to shape, construction, purpose and span.

SEM-III

32. Draw single storied building site plan layout.
33. Create objects on CAD workspace using Toolbars, Commands, Menus, formatting layer and style.
34. Draw a sanction plan of double storied flat roof residential building by using CAD.
35. Create objects on 3D modeling concept in CAD
36. Prepare a drawing of public building detailing with roof and coloumns by frame structures using CAD.
37. Prepare detailed drawing of RCC structures using CAD and prepare bar bending schedule.
38. Draw the details of a framed structure and portal frame of a residential building using CAD.
39. Draw the different types of steel sections, rivets and bolts using CAD.
40. Draw the details of girders, roof trusses and steel stanchions using CAD
41. Prepare the detailed drawing showing the different types of sanitary fittings, arrangements of manholes, details of septic tank using CAD
42. Draw the details flow diagram of water treatment plant (WTP) and Swerage Treatment plant (STP).

SEM-IV

43. Draw the cross sectional view of different types of roads showing component parts using CAD
44. Draw the details of different types of culverts using CAD
45. Prepare detailed drawing a bridge using CAD.
46. Draw the typical cross section of rail sections, railway tracks in cutting and embankment using CAD
47. Prepare detailed drawing of typical cross sections of Dam, barrages, weir and Cross drainage works using CAD
48. Draw the schematic diagram of different structures of Hydro electric project using CAD

49. Prepare detailed estimate and cost analysis of different types of building and other structures using application software.
50. Prepare rate analysis of different items of work.
51. Problems on preparing preliminary/Approximate estimates for building project.
52. Prepare a map using Total station.
53. Locate the station point using GPS and obtain a set of co-ordinates.

NOTE:

(1) Learning outcomes are reflection of total competencies of a trainee. Each learning outcome may include multiple assessment components. However assessment will be carried out as per assessable outcome and assessment criteria.

(2) The trainees must be able to carry out the learning outcomes, under close supervision, having limited skill requirements in a routine and predictable situation, with the ability to select the materials, tools and equipment in a limited context, understand the context of work and quality, and with the knowledge of basic facts and work processes, and with the responsibility for own work.

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING / ASSESSABLE OUTCOME	
ASSESSABLE OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy. 1.2 Recognize and report all unsafe situations according to site policy. 1.3 Identify and take necessary precautions on fire and safety hazards and report according to procedures. 1.4 Identify, handle and store / dispose off dangerous goods and substances according to site policy and procedures following safety regulations and requirements. 1.5 Identify and observe site policies and procedures in regard to illness or accident. 1.6 Identify safety alarms accurately. 1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures. 1.8 Identify and observe site evacuation procedures according to site policy. 1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment. 1.10 Identify basic first aid and use them under different circumstances. 1.11 Identify different fire extinguisher and use the same as per requirement 1.12 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution 1.13 Deploy environmental protection legislation & regulations 1.14 Take opportunities to use energy and materials in an environmentally friendly manner 1.15 Avoid waste and dispose waste as per procedure 1.16 Recognize different components of 5S and apply the same in the working environment.
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.	2.1 Obtain sources of information and recognize information. 2.2Use and draw up technical drawings and documents. 2.3 Use documents and technical regulations and occupationally related provisions. 2.4 Conduct appropriate and target oriented discussions with higher authority and within the team. 2.5 Present facts and circumstances, possible solutions &use English special terminology.

	2.6 Resolve disputes within the team 2.7 Conduct written communication.
3. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, statistics, co-ordinate system and apply knowledge of specific area to perform practical operations.	3.1 Semester examination to test basic skills on arithmetic, algebra, trigonometry and statistics. 3.2Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
4. Read and apply engineering drawing for different application in the field of work.	4.1 Semester examination to test basic skills on engineering drawing. 4.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
5. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	5.1 Semester examination to test the concept in productivity, quality tools and labour welfare legislation. 5.2 Their applications will also be assessed during execution of assessable outcome.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	6.1 Semester examination to test knowledge on energy conservation, global warming and pollution. 6.2 Their applications will also be assessed during execution of assessable outcome.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7.1 Semester examination to test knowledge on personnel finance, entrepreneurship. 7.2 Their applications will also be assessed during execution of assessable outcome.
8. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.	8.1 Semester examination to test knowledge on basic computer working, basic operating system and uses internet services. 8.2 Their applications will also be assessed during execution of assessable outcome.
9.Uder stand aand apply	9.1 Semester examination to test knowledge on management of work.

Management of Workers, Communication, Coordination and Team Management skills	Communication, Co ordination and Management skill. 9.2 Their applications will also be assessed during execution of assessable outcome. like, planning, scheduling, engineering, designing, procurement & contracting, execution

SPECIFIC ASSESSABLE OUTCOME:	
Semester-I	
ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**
10. Draw in Freehand Sketching of hand tools used in civil work.	10.1 Ensure data and information received are sufficient for preparation of drawing 10.2 (a) sketch horizontal lines from left to right, vertical lines downward, inclined lines in different angles by freehand, (b) draw freehand sketches of tools (viz. hoe, head pan, trowel, wooden float, plumb bob, sand screener) 10.3 Check the drawings to confirm their compliance with the supplied design / object.
11. Draw Plain figures applying drawing instruments with proper layout and the method of folding drawing sheets.	11.1(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 11.2(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. 11.3 (a) construct different types of geometrical figures from given data (b) construct ellipse with the given conditions.and parabolic curves using the various conditions given 11.4 Add specifications as per the drawing requirements provided and use relevant and appropriate symbols as per drawing requirement to provide details in the drawings 11.5 Check the drawings to confirm their correctness.
12. Construct plain scale, comparative scale, diagonal scale and vernier scale.	12.1 Read and interpret the drawing requirements. Ensure data and information received are sufficient for preparation of drawing. 12.2 draw different types of scales, 12.3find out R.F of the scale, calculate the length of scale on drawing, 12.4 construction of plain scales, comparative scales, diagonal scales and vernier scales, mark the distance on the scale. 12.5 Check the drawings to confirm their correctness.
13. Draw Orthographic projection of different objects with proper lines, lettering and dimensioning.	13.1 Read and interpret the drawing requirements. Ensure data and information received are sufficient for preparation of drawing. 13.2 Carry out necessary calculations to compute dimensions of

	Various components/ parts of drawings. 13.3 (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. 13.4 (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. 13.5 Check the drawings to confirm their compliance with the supplied design / object.
14. Draw Isometric, oblique and perspective views of different solid, hollow and cut sections with proper lines and dimensions as per standard convension.	14.1 Read and interpret the drawing requirements. Ensure data and information received are sufficient for preparation of drawing. 14.2 Carry out necessary calculations to compute dimensions of Various components/ parts of drawings. 14.3 construct an Isometric scale to a given length. draw the isometric projection of regular solids. 14.4 draw the isometric views for the given solids with hollow and cut sections. 14.5 draw the given objects/component in perspective view by Vanishing point method (i) Single point perspective (ii)Two point perspective/Angular perspective Visual ray method/multi-view method 14.6 Check the drawings to confirm their compliance with the supplied design / object.
15. Drawing of component parts of a single storied residential building with suitable symbol and scales.	15.1 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 15.2 construct parts of a building and list the sequence of construction. 15.3 draw and indicate the levels of different parts of building. 15.4 draw dressing and varieties of finishes, artificial stones, natural bed of stone 15.5 draw RCC used in different component parts of a building. 15.6 draw timber joints used in doors, windows and arches. 15.7 draw steel framing for pre-cast concrete, 15.8 use codes and other references that follow the required conventions 15.9(a) draw the appropriate signs and symbols for showing different types of openings used in drawing. (b) draw the signs and symbols of various types of doors windows and ventilators.

	15.10 Check the drawings to confirm their compliance with the supplied design / object.
16. Drawing of different types of stone and brick masonry.	16.1 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. 16.2 sketch the different types of stone masonry and bonding, 16.3 draw and mention the types of bonds used in brick masonry. 16.4 draw different types of special bricks. 16.5 add specifications and use codes and other references as per the drawing requirements 16.6 Check drawings to confirm their compliance with the supplied design.
17. Drawing of different types of shallow and deep foundation.	17.1 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. 17.2 . carry out necessary calculations to compute dimensions of Various components/ parts of drawings 17.3 draw different types of shallow and deep foundation 17.4(a) draw footing for column, (b) draw footings for wall, (c) draw stepped foundation and inverted arch foundation, 17.5 (a) draw grillage foundation (b) draw raft foundation 17.6 (a) draw various types of pile foundation, (c) draw pier foundation, (d) draw well foundation (caisson), 17.7 add specifications and use codes and other references as per the drawing requirements 17.8 Check drawings to confirm their compliance with the supplied design.
18. Drawing of different types of shoring, scaffolding, underpinning, form work and timbering.	18.1 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. 18.2 . carry out necessary calculations to compute dimensions of Various components/ parts of drawings 18.3 draw different types of shoring. 18.4 (a) draw different types of scaffolding. 18.5 draw different types of underpinning, 18.6 (a)draw the elevation of formwork for beams and slabs., (b) draw the details of form work for square or rectangular

	column (c) draw the details of form work for circular column, 18.5 draw the detail of form work for R.C.C wall. 18.6 (a) draw isometric view of different types of arch, 18.7 (a) draw isometric view of timbering for trenches in different types of ground. 18.8 add specifications and use codes and other references as per the drawing requirements 18.9 Check drawings to confirm their compliance with the required design.
19. Drawing of different types of damp proofing in different position.	19.1 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. 19.2 . carry out necessary calculations to compute dimensions of Various components/ parts of drawings 19.3(a) draw details of damp proofing in basement., (b) draw details of damp proofing in external wall, (c) draw details of damp proofing in internal walls, 19.4(a) draw details of damp proofing by cavity wall. (b) draw details of damp proofing in flat roof and parapet wall. 19.5(a) draw details of damp proofing of flat roof by tar felting, (b) draw details of damp proofing by mud phuska terracing with tile, (c) draw details of damp proofing in pitched roof. 19.6 draw sectional view of thermal insulation used in cold storage floor, walls and roof. 19.7 add specifications and use codes and other references as per the drawing requirements 19.8 Check drawings to confirm their compliance with the required design.
20. Drawing of different types of arches and lintels with chajja.	20.1 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. 20.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 20.3 sketch the various arches with number of centers, 20.4 Draw the elevation of flat arch, semi circular arch, segmental arch, elliptical arch, three centered elliptical arch, five centered, two centered arch, 20.5 Draw the elevation and section of wooden lintel, stone

	lintel, brick lintel, RCC lintel, steel lintel, reinforced brick lintel. 20.7 add specifications and use codes and other references as per the drawing requirements 20.8 Check drawings to confirm their compliance with the required design.

Semester-II	
ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**
21. Perfom site survey with chain / tape and prepare the site plan.	21.1 Interpret the drawing requirements 21.2 perform surveying measuring distance by chain, tape and other accessories. 21.3 enter Field book and ploting 21.4 Conduct the chain surveying and prepare the site map. 21.5 Calculate the area of the plot. 20.6 add specifications and use codes and other references as per the drawing requirements 20.7 Check drawings to confirm their compliance with the required design.
22. Perform the site survey using prismatic compass.	22.1 Interpret the drawing requirements 22.2 Observe the bearings of lines and conduct the traverse survey using compass and other accessories. 22.3 enter Field book and ploting 22.4 Calculate area and check the traverse. 22.5 prepare the site map. 22.6 add specifications and use codes and other references as per the drawing requirements 22.7 Check drawings to confirm their compliance with the required design.
23. Perform site survey with plane table and prepare a map.	23.1 Interpret the drawing requirements. 23.2 Perform plane table survey by the following methods: a) Radiation b) Intersection c) Traversing d) Resection (Orientation) 23.3 Prepare the traverse by any type of method, 23.4 Calculate area. 23.5 prepare the site map. 23.6 add specifications and use codes and other references as

	per the drawing requirements 23.7 Check drawings to confirm their compliance with the required design.
24. Make tropography map by contours with leveling instruments.	24.1. Interpret the drawing requirements. 24.2 Set leveling instrument and adjust the horizontal control. 24.3. Fix vertical control of points by leveling and booking readings in level book. 24.4. Determine reduced levels and check. 24.5. prepare a road project for a limited distance. 24.6. prepare a plot by contours, fix contour interval, interpolate contour points and draw contour lines. 24.7. Furnish all the details and complete the drawing 24.8 Check drawings to confirm their compliance with the required design and take out the print.
25. Perform a site survey with Theodolite and prepare the site plan	25.1 Interpret the drawing requirements. 25.2 conduct reconnaissance survey, prepare key plan, 25.3 mark station points, 25.4 prepare reference sketches, 25.5 measure lengths and bearing, 25.6 measure angles, repetition, 25.7 compute co-ordinates, check angles, calculate bearings, find consecutive co-ordinates, find independent co-ordinates; 25.8. prepare the traverse, 25.9 calculate area. 25.10 add specifications and use codes and other references as per the drawing requirements 25.11 Check drawings to confirm their compliance with the required design.
26. Drawing of different types of carpentry joints.	26.1 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. 26.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 26.3 draw different types of carpentry joints: (a) draw the views of lengthening joints (b) draw the views of widening joints 26.4(a) draw the views of bearing joints (b) angled or corner joints (c) oblique shouldered joints 26.5 add specifications and use codes and other references as per the drawing requirements

	26.6 Check drawings to confirm their compliance with the required design.
27. Draw different types of doors and windows according to manner of construction, Arrangement of component, and working operation.	27.1 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. 27.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 27.3 Draw ledged and battened door, ledged, battened and braced door And ledged, battened, broced and framed door 27.4 Draw panelled door and panelled and glazed door 27.5 (a) draw flush doors (b) draw collapsible door, (c) draw Sliding door 27.6 draw different types of fixtures and fastenings 27.7 draw the different types of windows: (a) panelled windows (b) metal windows(c) corner window (d) gable window (e) ventilators, etc. 27.8 add specifications and use codes and other references as per the drawing requirements 27.9 Check drawings to confirm their compliance with the required design.
28. Prepare the detailed drawing of electrical wiring system.	28.1 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. 28.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 28.3 Draw the signs and symbols used in wiring plan. 28.4 Furnish all the details and complete the drawing 28.5 add specifications and use codes and other references as per the drawing requirements 28.6 Check drawings to confirm their compliance with the required design.
29. Draw types of ground and upper floors	29.1 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. 29.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 29.3 draw section of a timber ground floor, brick floor, flag stone, concrete floor, terrazzo floor and mosaic floor. 29.4a) draw plan and section of single joist timber floor.

	(b) draw plan and section of double joist timber floor. (c) draw plan and section of triple of framed timber floor. (d) draw the section of brick jack arch floor. (e) draw the section of concrete jack arch floor. 29.5 add specifications and use codes and other references as per the drawing requirements 29.6 Check drawings to confirm their compliance with the required design.
30. Draw different types of vertical movement according to shape, location, materials in stair, lift, ramp and escalator.	30.1 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. 30.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 30.3 draw ramp 30.4 draw straight stair 30.5 draw quarter turn newel stair 30.6(a) draw bifurcated stair (b) draw quarterturn and geometrical stair (c) draw halfturn and R.C.C dog legged stair (d) draw the R.C.C open well stair (e)draw three quater turn stairs (f)draw spiral stairs 30.7(a) prepare the data table of the different loading capacity of a lift (b) draw the schematic diagram of lift well and other mountings for a load of 10 persons (c) draw the typical arrangements of a lift. 30.8 draw moving stairs (escalators) 30.9 add Symbols and specifications and use codes and other references as per the drawing requirements 30.10 Check drawings to confirm their compliance with the required design.
31. Draw different types of roofs according to shape, construction, purpose and span.	31.1 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. 31.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 31.3(a)draw lean-to-roof (b) draw the sectional elevation of couple roof (c)draw the sectional elevation of couple close roof 31.4(a) draw the sectional elevation of single collar roof (b)draw the sectional elevation of collar and scissors roof

	(c)draw the section of double or purlin roof 31.5(a)draw the elevation of king post truss (b) draw details of each joint of king post truss 31.6 (a)draw the elevation of queen post truss (b) draw details of each joint of queen post truss 31.7(a)draw the elevation of steel truss (b) draw details of joint of steel (c)draw the elevation of tubler steel truss (d) draw details of tubler steel truss 31.8 add Symbols and specifications and use codes and other references as per the drawing requirements 31.9 Check drawings to confirm their compliance with the required design.

Semester-III	
ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**
32. Draw single storied Building drawing site plan layout.	32.1 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. 32.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 32.3(a) draw the line diagram of the residential building. (b) draw size and position of rooms, wall thickness and number of openings. 32.4(a) develop the sectional plan of building (b) prepre sectional elevation as per the section plan (c) draw the elevation of building. (d) prepare working drawing of the building. 32.5 draw various interior and exterior furnishings details of a residence 32.6 create a site plan showing details. 32.7 prepare a key / location plan 32.8 prepare area statement. 32.9 add Symbols and specifications and use codes and other references as per the drawing requirements 32.10 Check drawings to confirm their compliance with the required design.
33.create objects on CAD workspace using tool bars, commands, menus and formatining layers and styles.	33.1 Ensure that computer system is correctly operating. Check that all required peripheral devices are connected and correctly operating 33.2. start up the software and adjust the page size, measurement unit, scale and plot area before staring the work

	33.3. Set drawing parameters like, colour, layer, line type, line weight, text font etc. prepare title block for the drawing covering specification required . 33.4 draw 2D drafting by using CAD toolbars and from set of tool icons in ribbon. 33.5 draw drawing using sortcut keyboard command. 33.6 creating templates, inserting drawings, Layers, Modify Layers 33.7 customize Dimension and Text styles. 33.8 provide title and dimension on object drawing. 33.9 add Symbols and specifications and use codes and other references as per the drawing requirements 33.10 Check drawings to confirm their compliance with the required design. 33.11 create layout space and viewports, 33.12 plot the drawing with required scale.
34. Draw a sanction plan of double storied flat roof residential building by using CAD.	34.1 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. 34.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 34.3 Use appropriate commands in the software to draw the required drawings as per standard practices. Use keyboard commands and pull down menus available in common cad systems to prepare the drawings 34.4 prepare drawing of plan, elevation, section, site plan location plan and area statement of double storied flat roof residential building with suitable symbols and scales according to local bye laws. 34.5 prepare structural arrangement of the above plan, 34.6 draw the plan sectional elevation and front elevation two storied residential building showing partly tiled and partly RCC flat roof. 34.7 prepare the working drawing of the building. 34.8 add Symbols and specifications and use codes and other references as per the drawing requirements 34.9 Check drawings to confirm their compliance with the required design.

35.Create objects on 3D modeling concept in CAD	35.1. start up the software and adjust the page size, measurement unit, scale and plot area before staring the work 35.2 Define 3D modeling concept in CAD 35.3 Demonstrate 3D coordinate systems to aid in the construction of 3D objects. 35.4 Create and use model space viewports. 35.5 Create a standard engineering layout. 35.6 Create and edit wireframe model 35.7 Create and edit solid mesh and surface modeling. 35.8 Create and edit simple 2D regions and 3D solid models. 35.9 Generate 3D text and dimensions using a variety of 3D display techniques. 35.10 Render a 3D model with a variety of lights and materials. 35.11 plot the drawing with required scale. 35.12 Check drawings to confirm their compliance with the required design.
36. Prepare a drawing of public building detailing with roof, column by framed structure using CAD	36.1 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. 36.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 36.3 prepare a Public Building drawing indicating all related data and service plan: (a) Village library – in RCC flat roof. (b) Workshop building – in pitch roof (c) Primary Health Centre – in RCC flat roof (d) Restaurant Building – in RCC flat roof 36.4 School building – in RCC flat roof. 36.5 Bank Building – in RCC flat roof. 36.6 add Symbols and specifications and use codes and other references as per the drawing requirements 36.7 Check drawings to confirm their compliance with the required design.
37. Prepare detailed drawing of RCC structures using CAD and prepare bar bending schedule.	37.1 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. 37.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 37.3 Draw different types of structural arrangements of RCC members and bar bending schedule: (a) Foundations (b) Rectangular beam (c) Column

	(c) Floor slab / roof slab (d) Lintel with chajja (e) stair (f) underground and overhead reservoir (g) Lift pit (h) septic tank (i) retaining wall 37.4 complete the drawing by furnishing the details, such as dimensioning and notes related to reinforcement 37.5 prepare a table containng weight of different bars. 37.6 prepare the bar bending schedule of the above structure. 37.7 add Symbols and specifications and use codes and other references as per the drawing requirements 37.8 Check drawings to confirm their compliance with the required design.
38. Draw the details of a framed structure and portal frame of a residential building using CAD.	38.1 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. 38.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 38.3 prepare the features of framed structure, portal frame and its reinforcement details. 38.4 add Symbols and specifications and use codes and other references as per the drawing requirements 38.5 Check drawings to confirm their compliance with the required design.
39. Draw the different types of steel sections, rivets and bolts using CAD.	39.1 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. 39.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 39.3 draw the different views of steel section, rivets and bolts. 39.4 prepare drawing of bolted and riveted joints in steel structures. 39.5 add Symbols and specifications and use codes and other references as per the drawing requirements 39.6 Check drawings to confirm their compliance with the required design.
40. Draw the details of girders, roof trusses and steel stanchions using CAD	40.1 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.

	40.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 40.3 draw the elevation and section of girders, roof trusses and steel stanchions. 40.4 add Symbols and specifications and use codes and other references as per the drawing requirements 40.5 Check drawings to confirm their compliance with the required design.
41. Prepare the detailed drawing showing the different types of sanitary fittings, arrangements of manholes, details of septic tank using CAD	41.1 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. 41.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 41.3 draw plumbing and sanitary appliances and sanitary fittings, 41.4draw system of plumbing. 41.5 design the septic tank according to the users. 41.6 draw the plan, and sectional elevation of man hole and septic tank. 41.7 draw the features of drainage system and sewer system. 41.8 draw the service plan. 41.9 add Symbols and specifications and use codes and other references as per the drawing requirements 41.10 Check drawings to confirm their compliance with the required design.
42. Draw the details flow diagram of water treatment plant (WTP) and Swerage Treatment plant (STP).	42.1 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. 42.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 42.3 draw the features and functions of water treatment plant (WTP) 42.4 draw the plan, longitudinal and cross sectional elevation of water treatment plant (WTP). 42.5 draw the features and functions of Swerage Treatment plant (STP). 42.6 draw the plan, longitudinal and cross sectional elevation of Swerage Treatment plant (STP). 42.7 add Symbols and specifications and use codes and other references as per the drawing requirements 42.8 Check drawings to confirm their compliance with the required design.

Semester- IV	
ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**
43. Draw the cross sectional view of different types of roads showing component parts using CAD	43.1 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. 43.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 43.3 draw and indicate the structural parts of different of roads for embankment and cutting as per IRC (a) camber (b) super-elevation (c) gradient (d) curves (e) side drain, etc. 43.4 add Symbols and specifications and use codes and other references as per the drawing requirements 43.5 Check drawings to confirm their compliance with the required design.
44.Draw the details of different types of culverts using CAD	44.1 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. 44.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 44.3 draw the half sectional Plan, longitudinal and cross sectional elevation of different culvert. 44.4 add Symbols and specifications and use codes and other references as per the drawing requirements 44.5 Check drawings to confirm their compliance with the required design.
45.Prepare detailed drawing a bridge using CAD	45.1 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. 45.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 45.3 Draw the features and parts of bridge, caisson, coffer dam and classification of bridges.

	45.4 Draw the half sectional - Plan, longitudinal and cross sectional elevation of bridge. 44.5 add Symbols and specifications and use codes and other references as per the drawing requirements 44.6 Check drawings to confirm their compliance with the required design.
46. Draw the typical cross section of rail sections, railway tracks in cutting and embankment using CAD	46.1 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. 46.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 46.3 draw coning of wheels, hogged rail, bending of rail, creep of rail and fixtures and fastenings 46.4 draw and indicate the structural parts of typical permanent way in cutting and embankment. 46.5 add Symbols and specifications and use codes and other references as per the drawing requirements 46.6 Check drawings to confirm their compliance with the required design.
47. Prepare detailed drawing of typical cross sections of Dam, barrages, weir and Cross drainage works using CAD	47.1 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. 47.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 47.3 draw detail drawing of Dams, barrages and weirs, cross drainage works and head regulators in irrigation structure. 47.4 add Symbols and specifications and use codes and other references as per the drawing requirements 47.5 Check drawings to confirm their compliance with the required design.
48. Draw the schematic diagram of different structures of Hydro electric project using CAD	48.1 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. 48.2 . Carry out necessary calculations to compute dimensions of Various components/ parts of drawings 48.3 draw the features of different structures of hydro electric project. 48.4 prepare the schematic diagram. 48.5 add Symbols and specifications and use codes and other references as per the drawing requirements 48.6 Check drawings to confirm their compliance with the required design.

49. Prepare detailed estimate and cost analysis of different types of building and other structures using application software.	49.1 Read and interpret the drawing requirements, specifications, etc. ensure data and information received are sufficient for preparation of estimation. 49.2 . Carry out necessary calculations to compute estimation and cost analysis. 49.3 prepare detailed estimate of a building. 49.4 prepare a detailed estimate for – boundary wall, septic tank, underground and overhead reservoir. 49.5 calculate the quantities in the standard format. 49.6 prepare abstract of estimate. 49.7 Check estimation and cost analysis to confirm their compliance with the design.
50. Prepare rate analysis of different items of work.	50.1 Read and interpret the drawing requirements, specifications, etc. ensure data and information received are sufficient for preparation of rate analysis. 50.2 . Carry out necessary calculations to compute estimation and cost analysis. 50.3 preapare rate analysis and identify the units of measurement. 50.4 calculation techniques of quantities of materials or by standard data. 50.5 calculate quantities of labour required for different item of work from standard data. 50.6 calculate the rate per unit of works of different items including labour charges from schedule of rate. 50.7 Check rate analysis to confirm their compliance with the design.
51. Problems on preparing preliminary/Approximate estimates for building project.	51.1 Read and interpret the drawing requirements, specifications, etc. ensure data and information received are sufficient for preparation of estimation. 51.2 Carry out necessary calculations to compute estimation and cost analysis. 51.3 Prepare the contents of a building project. 51.4 Calculatethe difference to be occur in structural detailing and various finishing. 51.5 Calculate the plinth area and cubical content rates. 51.6 Prepare and Check estimation and cost analysis to confirm their compliance with the design.

52. Prepare a map using Total station.	52.1. Interpret the drawing requirements. 52.2 adjust and fix the Total Station in an station point. 52.3 conduct reconnaissance survey-prepare key plan. 52.4 prepare reference sketches. 52.5 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 orientation-collect data-repeat same procedure at each stations. 52.6 download and process the data, prepare plan/map. 52.7 measure remote distance and elevation , 52.8 calculate 2D / 3D area on field/site., 52.9 calculates surface volume of field/site. 52.10 add specifications and use codes and other references as per the drawing requirements 52.11 Check drawings to confirm their compliance with the required one.
53. Locate the station point using GPS and obtain a set of co-ordinates.	53.1 Interpret the drawing requirements. 53.2 set up and use GPS equipment. 53.3 practical application of GPS and Components of GPS data processing. 53.4 determine the position of points 53.5 record and process the results, TOA,TOT,TOF, set the co-ordinates 53.6 open CAD and set up the basic requirement for drafting. comparison of GPS with GIS,CAD 53.7 export the details from GPS system 53.8 operate co- ordinate and time system, satellite and conversional geodetic system. and GPS. Signal, code, and biases 53.9 apply Remote sensing and Photogrammetry 53.10 perform tracking devises & system, time measurement and GPS timing 53.11 create arial photography, satellite images use pattern recognition and digital signal. 53.12 add specifications and use codes and other references as per the drawing requirements 53.13 Check drawings to confirm their compliance with the required one.

8. SYLLABUS

SYLLABUS FOR THE TRADE OF DRAUGHTSMAN CIVIL

First Semester

Duration: Six Month

LEARNING OBJECTIVES OF 1ST SEMESTER

Achievements of first semester

The Trainees should be able to :

1. Use drawing instruments and equipment, their care and maintenance.
2. Lay out of drawing sheets.
3. Construct plain & solid geometrical figures.
4. Solve simple problems on projecting of points, lines, surfaces & solids.
5. Draw sketches from models (plan, sections and Elevation).
6. Apply conventional signs and symbols in drawings.
7. Construct, read and use of plain, comparative, diagonal, vernier scales.
8. Draw the arrangements of bricks in different types of bonds in building and in foundation.
9. Have knowledge to prevent the structure with DPC.
10. Draw various types of arches & lintels.

Syllabus for TP 01 and TT 01

Week No.	Ref. Learning Outcome	Trade Practical (All drawings are in traditional)	Trade Theory
1	1. Recognize & comply safe working practices, environment regulation and housekeeping.	**1.**Importance of trade training, demonstrate tools & equipments used in the trade. (2 hr.) **2.** Importance of housekeeping & good shop floor practices. (2 hr.) **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 hr.) **4.** Disposal procedure of waste materials of the trade. (3 hr.)	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.

		5. Personal protective Equipments(PPE):- Basic injury prevention, Basic first aid. (4 hr.) **6.** Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. (3 hr.) **7.** Preventive measures for electrical accidents & steps to be taken in such accidents. (2 hr.) **8.** Use of Fire extinguishers. (8 hr.)	Introduction of PPEs. Introduction to 5S concept& its application. Response to emergencies e.g.; power failure, fire alarm, etc.
2	10. Draw free hand sketches of hand tools used in civil work.	**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 semester. • List of the Instruments, equipments and materials to be used during training.
3 & 4	11. Draw plane figure applying drawing instruments with proper layout and folding of drawing sheets.	**14.** Symbols & conventional representation for materials in sections as per IS 962-1989, SP-46:2003 for building drawings. (15 hrs.) **15.** Lines, lettering and Dimensioning. (24 hrs.) **16.** Construction of plain geometrical figures. (17 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.
5 & 6	12. Construct plain scale, comparative scale, diagonal scale and vernier scale	**17. Drawing of:-** Construction of scales – Plain, comparative, diagonal, vernier & scale of cords. (56 hrs.)	• Knowledge of different types of scale. Principle of R.F. **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.
7 to 9	13. Draw orthographic projections of different objects with proper lines, lettering and dimensioning. 14. Draw Isometric, oblique and perspective views of different solid, hollow and cut sections with proper lines and dimensions as per standard convension.	**Drawing of :-** **18.** Three views in Orthographic Projection of Line, plane, Solid objects & section of solids. (28 hrs.) **19.** Isometric Projection of geometrical solids. (28 hrs.) **20.** Construction of solid geometrical figures. (10 hrs.) **21.** Oblique and Perspective views of step block. (18 hrs.)	• Different types of projection views: Orthographic, Isometric, Oblique and Perspective. **Building materials**:- • ***Sand:-*** characteristics,types & uses. • ***Clay Products*** :– types, earthenware, stoneware, porcelain, terracotta, glazing. • ***Mortar*** & ***Concrete***:– Types,uses, preparation, proportion, admixtures and applications.

10	15. Draw component parts of a single storied residential building with suitable symbols and scales.	**22. Drawing of :-** Component parts of a single storied residential building. (in sectional details) Showing Foundation, Plinth, Doors, Windows, Brick work, Roof, Lintel and Chajjah, etc. (28 hrs.)	**Building materials**:- • ***Timber***:- Types, Structure, disease & defects, characterstic, seasoning, preservation and uitility. • ***Alternaative material to Timber*** Plywood, Block board, Particle board, Fireproof reinforced plastic(FRP), Medium density fireboard (MDF) etc. • ***Tar, bitumen, asphalt:-*** Properties, application and uses.
11 & 13	16. Draw different types of stone and brick masonry.	**23. Draw** Details of stone masonry including stone joints. (26 hrs.) **24. Drawing of :-** Different types of brick bonding Showing arrangement of bricks in different layers as per thickness of wall, pillars, copying, etc. (58hrs.).	**Protective materials**:- • ***Paints***:- characteristic, types, uses. • ***Varnishes*** :– characteristics and uses. • ***Metal:***– characteristic, types, uses. • ***Plastics*** :– characteristic, types, uses. **Building Construction**:- • Sequence of construction of a building. • Name of different parts of building. • ***Stone masonry:-*** • Terms, use and classification. • Principle of construction, composite masonry. • Strength of walls. • Strength of masonry. • ***Brick masonry*** – principles of construction of bonds. Tools and equipments used.
13 to 16	17. Draw different types of shallow and deep	**Drawing of Foundation**:- Drawing of different types of foundation –	**Building Construction**:- **Foundation**:- • Purpose of foundation

	foundation.	**Shallow** :- **25.** Spread Footing. (20 hrs.) **26.** Grillage foundation(22 hrs.) **Deep -** **27.** Pile foundation. (22 hrs.) **28.** Raft foundation(18 hrs.) **29.** Well foundation. (18 hrs.) **30.** Special foundation. (12 hrs.)	• Causes of failure of foundation • Bearing capacity of soils • Dead and live loads • Examination of ground • Types of foundation • Drawing of footing foundation setting out of building on ground excavation Simple machine foundation
17 & 18	18. Draw different types of shoring, scaffolding, underpinning, form work and timbering.	**Drawing of :-** **31.** Shoring (16 hrs.) **32.** Scaffolding (16 hrs.) **33.** Underpinning(14 hrs.) **34.** Timbering(14 hrs.)	**Building Construction**:- • Types of shoring and scaffolding in details. • Types of Underpinning and Timbering in detail
19	19. Drawing of different types of damp proofing in different position.	**Drawing details of treatments in building:-** **35.** Damp proofing(05 hrs.) **36.** Anti-termites(5 hrs.) **37.** Fire proofing(15 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. • **Anti-termite treatment –** objectives, uses and application**s.** • **Weathering course –** objectives and materials required. • **Fire proofing -** effect and rules.
20 &21	20. Drawing of different types of arches and lintels with chajja.	**Draw different forms of :-** **38.** Arches. (20 hrs.) **39.** Lintels. (10 hrs.) **40.** Lintels with Chajjahs (20 hrs.)	• **Arches: -** Technical terms-. types ,centring • ***Lintel :-*** types,wooden, brick, stone, steel & RCC. • Chajjahs – characteristics, Centring & Shuttering
22 & 23		Project work / on the job training Broad area :-	

		Prepare innovative drawing/ model on • Stone/ brick masonry • Shallow/ deep foundation • Shoring, scaffolding, frame work and timbering • Damp proofing • Arches and lintels with chajja.
24		Revision
25 & 26		Examination

Note: -

1. Some of the sample project works (indicative only) are given against each semester.
2. Instructor may design their own project and also inputs from local industry may be taken for designing such new project.
3. The project should broadly cover maximum skills in the particular trade and must involve some problem solving skill.
4. If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce part/ sub-drawings in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.

Second Semester
Duration: Six Months

LEARNING OBJECTIVES OF 2ND SEMESTER

Achievements of second semester

The Trainees should be able to :

1. Conduct the chain surveying and prepare the site plan.
2. Observe the bearings of lines and conduct the traverse survey using compass.
3. Prepare longitudinal and cross sections of the given route. by using auto level
4. Calculation of reduced levels of various points
5. Prepare a contour map.
6. Conduct traverse survey using theodolite.
7. Prepare topographical map using theodolite and level.
8. Draw different type of doors and windows including knowledge of Carpentry joints.
9. Prepare the detailed drawing of electrical wiring system.
10. Draw different ground floors.
11. Draw different types of roofs with all details.
12. Draw upper floors including general principles of construction.
13. Draw truss and stair cases.

Syllabus for TP 02 and TT 02

Week No.	Ref. Learning Outcome	Trade Practical (All drawings are in traditional)	Trade Theory
27-30	21. Perform site survey with chain / tape and prepare site plan. 22. Perfom site survey using prismatic compass.	**Surveying:-** **Chain Survey :- (50 hrs.)** **41.** Equipment and instrument used to perform surveying. **42.** Distance measuring with chain and tape. **43.** Entering Field book and plotting. **44.** Calculating the area of site. **45.** Prepare site planwith the help of Mouza map. **Compass survey:- (35 hrs.)** **46.** Field work of prismatic compass survey. **47.** Plotting of prismatic	***Surveying:-*** • Introduction, History and principles of chain survey. • Instrument employed. • Use, care, maintenance and common terms. • Classification, accuracy, types. • Main divisions (plane & geodetic). • Chaining. • Speed in field and office work. • Knowledge of Mouza Map. **Compass survey:-** • Instrument and its setting up • Bearing and each included angle of close traverse. • Local attraction.

	23. Perform site survey with plane table and prepare a map.	compass survey. **48.** Testing and adjusting the compass. **49.** Observation of bearings. **50.** Bearing a line. **51.** F.B.,B.B., R.B.,W.C.B. of a Line,Traverse and also check the close traversing. **Plane Table Survey :- (15 hrs.)** **52.** Surveying of a Building site with Plane Table.	• Magnetic declination and its true bearing. • Precaution in using prismatic compass. **Plane table survey:-** • Instrument used in plane table survey • Care and maintenance of plane table
31-34	24. Make tropography map by contours with leveling instruments.	***Levelling***:- (100 hrs.) **53.** Handling of levelling instruments & their settings **54.** Temporary adjustment of a level. **55.** Simple levelling. **56.** Differential levelling (Fly levelling). **57.**Carry out Levelling field book. **58.** Equate Reduction of levels – Height of collimation and Rise and Fall method – Comparison of methods. **59.** Solve problems on reduction of levels **60.** Calculate Missing data and how to fill it up–calculations & Arithmatical checkin various problems and its solution. **61.** Practice leveling with different instruments . **62.** Check levelling. **63.** Profile levelling or Longitudinal , plotting the profile. **64.** Surveying of a building site with chain and Levelling	***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 leveling, Application to chain and Levelling Instrument to Building construction. • Contouring ;-Definition, Characteristics, Methods. • Direct and Indirect methods • Interpolation of Contour, Contour gradient , Uses of Contour plan and Map. • Knowledge on road project.

		Instrument with a view to computing earth work. **65.** Contour - Direct and Indirect methods. **66.** Make Topography map, contours map. **67.** Solve trigonometric problems. **68.** Prepare a road project in a certain alignment.	
35-37	25. Perform a site survey with Theodolite and prepare site plan.	**Theodolite survey:-** **69.** Field work of theodolite. **70.** Horizontal angle. **71.** Vertical angle. **72.** Magnetic bearing of a line. **73.** Levelling with a theodolite. **74.** Calculation of area from traverse. **75.** Determination of Heights. **76.**Calculation of departure, latitude, northing and easting - (Total 50 hrs.) **77.** Setting out work- Building,culvert, centre line of Dams,Bridges and Slope of Earth work, etc. (25 hrs.)	**Theodolite survey:-** • Introduction. • Types of theodolite. • Uses, Methods of Plotting. • Transit vernier theodolite. • Terms of transit theodolite. • Fundamental line of theodolite. • Adjustment of theodolite. • Checks, Adjustment of errors. • Open and closed traverse and their application to Engineering Problems. • Vernier scale- types. • Measurement of horizontal angle. • Measurement of vertical angle. • Adjustment of a close traverse. • Problems in transit theodolite- departure, latitude, northing and easting.
38-39	26. Drawing of different types of carpentry joints. 27. Draw different types of doors and windows according to Manner of construction, Arrangement of	**Making detailed drawing of :-** **78. Carpentry joints:-** lengthening, bearing, housing, framing, panelling & moulding. (20 hrs.) **79.** Different Types doors including panelled, glazed and flush door. (20 hrs.) **80.** Different types windows and ventilators. (10 hrs.)	• **Carpentry joints** :-terms, classification of joints, Uses, types of fixtures , fastenings. • **Doors –**Parts, Location, standard sizes, types. • ***Windows***-types. • ***Ventilators***-purpose-types.

	component, and working operation		
40	28. Prepare the detailed drawing of electrical wiring system.	**Electrical Wiring:-** Prepare drawing of **81.** Wiring in different system. (5 hrs.) **82.** Electrical wiring plan with all fittings showing in drawing. (20 hrs.)	**Electrical Wiring**:- • Safety precaution and elementary first aid. • Artificial respiration and treatment of electrical shock • Elementary electricity. • General ideas of supply system. • Wireman's tools kit. Wiring materials. Electrical fittings. • System of wirings. Wiring installation for domestic lightings.
41-42	29. Draw types of ground and upper floors	**Drawing details of:-** **83.** types of ground & upper floors. (25 hrs.) **84.** Various floor finishing, sequence of construction. (25 hrs.)	• **Floors** – Ground floor & upper floor-Types. • **Flooring-** materials used types.
43-44	30. Draw types of vertical movement according to shape, location, materials by using stair, lift, ramp and escalator.	**Drawing different forms of vertical movements:-** **85.** As per shape - Drawing of straight, open newel, dog-legged, geometrical and bifurcated stairs & spiral stairs. (15 hrs.) **86.** As per material - brick, stone, wooden, steel & RCC stairs. (20 hrs.) **87.** Drawing of Lift and Escalator (15 hrs.)	• **Stairs:-** Terms. Requirements, Planning and designing of stair and details of construction. • Basic concept of lift and Escalator
45-47	31. Draw different types of roofs truss according to shape, construction, purpose and span	**Drawing details of:-** **88.** Slopped/Pitched Roof Truss - King Post and Queen Postroof trusses showing detailed connections. (30 hrs.) **89.**Steel roof trusses showing detailed connections. (25 hrs.) **90.** Wooden roof truss, showing	**Roofs & Roof coverings: –** • purposes,Elements,Types,Flat, pitched. • ***Truss***-king post, queen post, mansard, bel-fast, steel, composite. • ***Shell***-types-north-light & double curved. • ***Dome.*** Components parts. • ***Roof & coverings*** – objectives, types & uses.

		detailed connections. (20 hrs.)	
48-49		Project work / on the job training Broad area :- 1. Prepare site map using chain/prismatic compass/plane table / leveling instrument/ theodolite 2. Prepare innovative drawing/model of doors/ windows 3. Prepare innovative drawing/model of vertical movement/roofs.	
50		Revision	
51-52		Examination	

Note: -

1. Some of the sample project works (indicative only) are given against each semester.
2. Instructor may design their own project and also inputs from local industry may be taken for designing such new project.
3. The project should broadly cover maximum skills in the particular trade and must involve some problem solving skill.
4. If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce part/ sub-drawings in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.

Third Semester
Duration: Six Month

LEARNING OBJECTIVES OF 3RD SEMESTER

The Trainees should be able to :-

1. Draw plan, section and elevation of residential building (single story and double) with help of sketches, and line diagrams.
2. Practice on CAD,explain method of giving commands,explain drawing area set up explain drawing & settings.
3. Follow principles of planning, local building by laws with ISI standards.
4. Draw perspective view of building.
5. Make Inking Lerroy set printing of letters and tracing including practice of blue prints.
6. Create objects on 3D modeling concept in CAD
7. Prepare detailed drawing of reinforced bars showing shape of bend, hook, details of crank and development length
8. Draw the details of an RCC stair
9. Draw the details of one way slab and two way slab and prepare bar bending schedule

10. Draw reinforcement details of T-beam, Inverted beam and Cantilever.
11. Draw reinforcement details of RCC retaining wall.
12. Prepare the reinforcement details of column with footing and continuous columns
13. Draw the details of a framed structure and portal frame.
14. Draw the different types of steel sections, rivets and bolts
15. Draw the elevation and section of girders.
16. Draw the details of plate girders, roof trusses and steel stanchions
17. Prepare the detailed drawing of various pipe joints
18. Prepare the detailed drawing showing the different types of sanitary fittings, arrangements of manholes, details of septic tank in plumbing system of new technology
19. Draw the details of RCC water tank
20. Draw the details flow diagram of water treatment plant (WTP) and Swerage Treatment plant (STP).
21. Prepare service plan of a building

Syllabus for TP 03 and TT 03

Week No.	**Ref. Learning Outcome**	Trade Practical (Drawings 1 & 2 are in traditional & 3 to 21 are in computer drafting)	Trade Theory
53-54	32. Draw single storied Building site plan layout.	**Drawing details of**:- **91.** Single storied residential house with attached bath of both pitched and flat roof -(10 hrs.) **92.** Making plan, elevation, and section with aid of line diagrams of the building. – (25 hrs.) **93.** Layout and detailing of residential building. (5 hrs.) **94.** Create a drawing of building showing set backs. (5 hrs.) **95.** Showing layout plan and key plan. (5 hrs.)	**Building:-** • Principle of planning • Objectives & importance. • Function& responsibility. • Orientation. • Local building Bye-Laws as per ISI code. • Lay out plan & key plan. • Submitted in composition of drawing. • Provisions for safety. • Requirement of green belt and land.
55-56	33. Create objects on CAD workspace using Toolbars, Commands, Menus, formatting layer and style.	**Computer practice**:- **96.** Function of keys and practice of basic commands. (5 hrs.) **97.** Use of elementary commands by CAD toolbar. (4 hrs.) **98.** Creation of objects in	**Computer aided drafting:-** • Operating system ,Hardware & software. • Introduction of CAD. • Its Graphical User Interface. • Method of Installation. • Basic commands of CAD.

		different layers on CAD workspace . (10 hrs.) **99.** Plotting of drawing from CAD. (01 hr.) **100.** 2D drafting of flash door, panel door, window, hand railing, wash basin, sewerage pipe joints, etc. (20 hrs.) **101.** Preparing Library folder by creating blocks of the above items. (10 hrs.)	• Knowledge of Tool icons and set of Toolbars. • Knowledge of shortcut keyboard commands.
57-58	34. Draw a sanction plan of double storied flat roof residential building by using CAD.	**Building Drawing (Residential)** Prepare:- **102.** Plan, section and elevation of buildings with specifications for the given line drawing to suitable Scale. (30 hrs.) **103.** A Reading room with R.C.C flat roof. (5 hrs.) **104.** A House single storeyed residential building with single bed room and attached bathroom with R.C.C. flat roof slab. (15 hrs.)	**Building Planning**:- • Economy & orientation. • Provision for lighting and ventilation. • Provision for drainage and sanitation. • Types of building. • Planning & designing of residential , public and commercial building.
59-60	**-- DO --**	**105.** A residential building with double beded rooms with R.C.C. flat roof slab. (10 hrs.) **106.** House with single bed and hall with partly tiled and partly R.C.C. flat roof slab. (10 hrs.) **107.** Two roomed house with RCC slope roof with gable ends. (10 hrs.) **108.** A House with fully tiled roof with hips and valleys. (10 hrs.) **109.** Design and create a double storied residential building (3BHK) with	**Prefabricated Structure**:- • Preparation. • Method of construction, assembling. • Advantages & disadvantages.

		Positioning layout of Furniture, Electrical appliances and plumbing / sanitary fittings. (10 hrs.)	
61	35.Create objects on 3D modeling concept in CAD	**3D modeling in CAD :-** **(25 hrs.)** **110.** Create and use model space viewports. **111.** Create a standard engineering layout. **112.** Create and edit wireframe model **113.** Create and edit solid mesh and surface modeling. **114.** Create and edit simple 2D regions and 3D solid models. **115.** Generate 3D text and dimensions using a variety of 3D display techniques. **116.** Render a 3D model with a variety of lights and materials.	3D modeling concept in CAD • 3D coordinate systems to aid in the construction of 3D objects • Knowledge of shortcut keyboard commands.
62-63	35. Prepare a drawing of public building detailing with roof, column by framed structure using CAD	**Building Drawing (Public)** Prepare:- **117.** A Primary health center for rural area with R.C.C roof. (10 hrs.) **118.** A Village Library building with R.C.C flat roof. (05 hrs.) **119.** A small Restaurant building with R.C.C flat roof. (05 hrs.) **120.** A Single storeyed School building with R.C.C flat roof. (10 hrs.) **121.** A Small workshop with north light steel roof truss (6 to 10m Span) over R.C.C. Columns. (10 hrs.) **122.** Service plans. (5 hrs.) **123.** A Bank building with	• ***Parks & play ground-*** Types of recreation, landscaping. etc • ***Concepts of design of earthquake resisting buildings-*** requirements resistance , safety, flexible building elements, special requirements, base isolation techniques.

		R.C.C flat roof. (5 hrs.)	
64-65	36. Prepare detailed drawing of RCC structures using CAD and prepare bar bending schedule.	**Drawing details of RCC members with reinforcement:-** **124.** Rectangular beams(Single reinforced & Double reinforced). (15 hrs.) **125.** Lintel, chajjas &slabs. (10 hrs.) **126.** Stair - details of step. (15 hrs.)	**Reinforced cement concrete structure:-** • Introduction to RCC uses. • Materials – proportions • Form work • Bar bending details as per IS Code. • Reinforced brick work.
66-68	**-- DO –** 37. Draw the details of a framed structure and portal frame of a residential building using CAD.	**Draw Reinforced details of RCC members:-** **127.** Preparing bar-bending schedule. (10 hrs.) **128.** Details of one-way slab & two-way slab. (20 hrs.) **129.** T-beam, Inverted beam, cantilever, retaining wall, Lift well. (15 hrs.) **130.** Column with footing. (10 hrs.) **131**. Continuous columns showing disposition of reinforcement. (10 hrs.) **132.** RCC framed structure, portal frame, B.I.S. Code 456-2000, SP - 34 and its application. (10 hrs.)	**Materials used for RCC:-** • Construction. • Selection of materials – coarse aggregate, fine aggregate, cement water and reinforcement. • Characteristics. • Method of mixing concrete – machine mixing and hand mixing. • Slump test. • Structure – columns, beams, slabs - one-way slab & two-way slab. • Innovative construction. • Safety against earthquake. • Grade of cement, steel-behaviour and test. • Bar-bending schedule. • Retaining wall. • R.C.C. Framed structure.
69-70	38. Draw the different types of steel sections, rivets and bolts using CAD. 39. Draw the details of girders, roof trusses and steel stanchions using CAD	**Drawing of different types of**:- **133.** Steel sections, rivet,bolts,etc. (15hrs.) **134.** section and elevation of girders. (10 hrs.) **135.** Structural Joints. (10 hrs.) **136.** Plate girders roof trusses, stanchion etc. (15 hrs.)	**Steel structures:-** • Conmen forms of steel sections. • Structural fasteners , Joints. • Tension & compression member. • Classification, fabrication. • Construction details.

71-73	40. Prepare the detailed drawing showing the different types of sanitary fittings, arrangements of manholes, details of septic tank using CAD 41.Draw the details of rapid sand filter.	**Public Health & Sanitation**. **137.** Drawings of showing various pipe joints for underground drainage. (10 hrs.) **138.** Types of sanitary fittings in multi-storeyed building. (10 hrs.) **139.** Manholes and septic tank. (15 hrs.) **140.** Water supply system. (10hrs.) **141.** R.C.C square overhead tank supported by four columns. (10 hrs.) **142.** Preparation of service plan(drainage plan)for isolated building & in sewer system. (10 hrs.) **143.** Drawings of toilet fixtures. (5 hrs.) **145.** Flow diagram of water treatment plant (WTP) and Swerage Treatment plant (STP). (5 hrs.)	**House drainage of building**:- • Introduction. • Terms used in PHE. • Systems of sanitation. • System of house drainage. • plumbing, sanitary fittings, etc. • Types of sewer appurtenance. • Systems of plumbing. • Manholes & Septic tank. • Water treatment plant • Swerage treatment plant
74-75		Project work / on the job training Broad area :- 1. Draw residential building plan of single/ double storied building using CAD for Municipal/ approval 2. Prepare drawing of public building detailing with roof, structure etc. using CAD. 3. Prepare drawing of Bath/ Kitchen/ Reception Hall in details using Auto CAD 3D modeling with rendering.	
76		Revision	
77-78		Examination	

Note: -

1. Some of the sample project works (indicative only) are given against each semester.
2. Instructor may design their own project and also inputs from local industry may be taken for designing such new project.

3. The project should broadly cover maximum skills in the particular trade and must involve some problem solving skill.
4. If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce part/ sub-drawings in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.

Fourth Semester
Duration : Six Month

LEARNING OBJECTIVES OF 4TH SEMESTER

The Trainees should be able to :-

1. Draw the cross sectional view of different types of roads showing component / parts.
2. Draw the detailed longitudinal section of road showing its gradient, Typical plan showing curve.
3. Draw the details of different types of culverts and bridge.
4. Draw the typical cross section of rail sections, railway tracks in cutting and embankment.
5. Prepare detailed drawing of typical cross sections of Dam, barrages and weir
6. Draw the detailed sectional view of distributaries and head regulators.
7. Prepare the detailed drawing of different types of cross drainage works.
8. draw the schematic diagram of different structures of Hydro electric project.
9. Prepare detailed estimate of a building – quantity of items required, rate analysis, etc..
10. Prepare the detailed estimate by using software.
11. Demonstrate and Conduct practical traverse survey using Total station.
12. Set up and Demonstrate use of GPS and apply in survey work.

Syllabus for TP 04 and TT 04

Week No.	Ref. Learning Outcome	Trade Practical (Drawings are in computer drafting)	Trade Theory
79-81	42. Draw the cross sectional view of different types of roads showing component parts using CAD.	**Roads:-** **146.** Draw showing road structure and component parts. (25 hrs.) **147.** Prepare a drawing of Cross-sections showing the different types of roads- according to location & materials. (30 hrs.) **148.** Prepare a drawing of	**Roads:-** • Introduction. • History of highway development. • General principles of alignment. • Classification and construction of different types of roads, • Component parts. • Road curves, gradient.

		road curves & gradient. (20 hrs.)	• Curves-types, designation of curves. • Setting out simple curve by successive bisection from long chords. • simple curve by offsets from long chords. • Road drainage system.
82-83	43.Draw the details of different types of culverts using CAD 44.Prepare detailed drawing a bridge using CAD	**Bridge & Culvert :-** Prepare drawing of - **149.** Different types of culvert. (10hrs.) **150.** Preparing drawing of an arched bridge. (10 hrs.) Draw plan and sectional views of the following:- **151.** R.C.C Slab Culvert with splayed wing walls. (10 hrs.) **152.** Steel Foot over bridge across a highway. (10 hrs.) **153.** Two span Tee Beam Bridge with square returns. (10 hrs.)	**Bridges & Culvert**:- • Introduction to bridges. • Component parts of bridge. • Classification of culverts. • IRC loading. • Selection of type and location. • Factors governing the ideal site. • Alignment of bridge. • Foundation -selection-caisson. • Coffer dam- types. • Types of super structure. • Substructure-piers, abutments, wing walls. • Classification of bridge. • Tunnels- rules used for the sizes of different members.
84-85	45. Draw the typical cross section of rail sections, railway tracks in cutting and embankment using CAD	**Railway:-** **154.** Draw typical cross section of rail track. (05 hrs.) **155.** Draw Railway tracks – embankment layout plans of railway platform. (20hrs.) **156.** Draw typical cross-section of railway tracks cutting & embankment (single lane & double lane). (20 hrs.) **157.** draw layout of signalling points & crossing. (05hrs.)	**Railways :-** • Permanent way • Rail gauges, Functions, Requirements, Types, Sections, Length of rail. • Welding of rail, wear of rail. • Coning of wheels, hogged rail, bending of rail, creep of rail. • Causes and prevention of creep. • Sleeper and ballast-function, types, requirement, materials, rail. • Fixtures, Fastenings and

			plate laying in rail. • Joints-types, fish plate, fish bolt-spikes, chairs and keys-bearing plate, block elastic, base plate. • Anchors and anti-creepers. • Construction of permanent ways. • Railway station and yard.
86-89	46. Prepare detailed drawing of typical cross sections of Dam, barrages, weir and Cross drainage works using CAD 47. Draw the schematic diagram of different structures of Hydro electric project using CAD	**Drawing of different types of irrigation structures: –** **158.** Dams, barrages, weir etc. (15 hrs.) **159.** Longitudinal section of distributaries with the help of given sketch & data. (15 hrs.) **160.** Head regulators. (15 hrs.) **161.** Types of cross drainage work. (15hrs.) **162.** Hydro electric project. (15 hrs.) **Drawing of canal** **163.** Alignment including longitudinal and cross sections of canals with the given data. (25 hrs.)	**Irrigation Engineering:-** • Terms used in irrigation. • Hydrology like duty, delta, base period, intensity of irrigation. • Hydrograph, peak flow, run off, catchment area, CCA, corps like, rabi, kharif etc. • Storage, diversion head work -characteristics and types. • Reservoir –types of reservoirs, i.e., single purpose and multi-purpose, area, capacity and curves of reservoir. • Dams, weir & barrages- types purposes. • Hydro electric project like Forebay, Penstock, Turbines, Power house, etc. • **Canals**- classification and distribution system, canal structures. • Types of cross drainage works like Aquaduct, Super passage, Syphon, Level crossing, inlet and outlet, etc.
90-94	48. Prepare detailed estimate and cost analysis of different types of building and other structures using application software.	**Estimating and Costing:- (visualizing the plotted drawing)** **164.** Prepare detailed Estimate :-Calculate quantities of items of	**Estimating and Costing** :- • Introduction. • Purpose and common techniques. • Drawing of construction. • Measurement techniques. • Estimate-necessity,

	49. Prepare rate analysis of different items of work. 50. Problems on preparing preliminary/Approximate estimates for building project.	single storied and double storied building. (20 hrs.) **165.** Prepare abstract of estimate by prevailing rates. (15 hrs.) **166.** Prepare rate analysis of major items - RCC, PCC, Wood works, Stone & Brick masonry & Plastering. (25 hrs.) **167.** Solve problems on preparation of preliminary / approximate estimates for building projects by Excel worksheet as per Govt. schedule. (20 hrs.) **168.** Familiarisation with and making estimation with software. (20 hrs.) **169.** Estimate earthwork of irregular boundaries. (15hrs.)	importance, types- approximate and detailed estimate-main and sub estimates, revised, supplementary, maintenance / repair estimate-taking off quantities- method • Rate analysis of typical items and their specifications. • Labour and materials. • Govt. Schedule of rate. • Estimating of irregular boundaries by trapezoidal and Simpsons formula.
95-97	51. Prepare a map using Total station.	**Total Station:-** **170.** Application of survey using TS. (5 hrs.) **171.** Field procedure for co-ordinate measurement. (10 hrs.) **172.** field procedure to run open traverse and closed traverse. (10 hrs.) **173.** Transfer or establish Bench Mark. (5 hrs.) **174.** Perform stakeout / demarcation of building layout /plot layout/ roads/ alignment. (10 hrs.) **175.** Measure remote distance and elevation. (10 hrs.) **176.** Calculate surface area	**Total Station:-** – • Introduction. • components parts, accessories used. • characteristics, features. • advantages and disadvantages. • principle of EMD. • Working and need. • Setting and measurement. • Electronic, display & Data reading. • Rectangular and polar co-ordinate system. • Terminology of open and closed traverse.

		on field/site. (5 hrs.) **177.** Calculate volume of field/site. (5 hrs.) **178.** Procedure for down load and up load data. (5 hrs.) **179.** Simple survey map using Auto CAD. (10 hrs.)	
98-99	52. Locate the station point using GPS and obtain a set of co-ordinates.	**GPS Awareness:-** **180.** Practical application of GPS Components of GPS data processing. GPS signal. Code and biases Techniques of GPS observing. Set up and use GPS equipment. – (Total - 15hrs.) **181.**Use GPS for a static survey (STK), in real time(RTK) mode. Record and process results to obtain a set of co-ordinates. (30 hrs.) **182.** Compare with GPS, GIS,GNSS & CAD. (5 hrs.)	**GPS (Global Positioning System):-** • Introduction of GPS system. • Co- ordinate and time system. • Satellite and conversional geodetic system. • GPS. Signal, code, and biases • Role of TRANSIT in GPS development. • GPS segment organisation. • GPS survey methods. Basic geodetic co-ordinate. • Ground support equipment, signals. • Tracking devises & system. • Time measurement and GPS timing. • Definition and application of Remote sensing,Photogrammetry, Arial photography, satellite images. • Pattern recognition and digital signal.
100-101		Project work / on the job training Auto CAD 3D modelling with rendering (material, light, shadow, etc.) Broad Area :- 1. Prepare project drawing of Roads with cross sectional views showing different components using CAD. 2. Prepare detail project drawing of Culvert/ bridge using Auto Cad 3D modeling with rendering. 3. Prepare project drawing of Dam/ barrage/Weir with cross sectional views using Auto CAD 3D modeling with	

		rendering.
102		Revision
103-104		Examination

Note: -

1. Some of the sample project works (indicative only) are given against each semester.
2. Instructor may design their own project and also inputs from local industry may be taken for designing such new project.
3. The project should broadly cover maximum skills in the particular trade and must involve some problem solving skill.
4. If the instructor feels that for execution of specific project more time is required than he may plan accordingly to produce part/ sub-drawings in appropriate time i.e., may be in the previous semester or during execution of normal trade practical.

9.1 Syllabus for Workshop Calculation and Science

First Semester
Duration: Six Month(42 Hrs)

Topic No.	Workshop Calculation	Workshop Science	Total Hrs.
1	**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	**Material Science** : properties - Physical & Mechanical, Types – Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.	42
2	**Fractions** : Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator.	**Mass ,Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.	
3	**Square Root** : Square and Square Root, method of finding out square roots, Simple problem using calculator.	**Speed and Velocity**: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.	
4	**Ratio & Proportion** : Simple calculation on related problems.	**Work, Power and Energy**: work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.	
5	**Percentage** : Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.		

Second Semester

Duration: Six Month(42 Hrs)

Topic No.	Workshop Calculation	Workshop Science	Total Hrs.
1	**Algebra** : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	**Heat & Temparature**: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.	42
2	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids – cube, cuboid, cylinder and Sphere.	**Basic Electricity**: Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections – series, parallel, electric power, Horse power, energy, unit of electrical energy.	
3	**Trigonometry:** Trigonometrical ratios, measurement of angles. Trigonometric tables	**Levers and Simple Machines:** levers and its types. Simple Machines, Effort and Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage.	

Third Semester

Duration: Six Month(42 Hrs)

Topic No	Workshop Calculation	Workshop Science	Total Hrs.
1	- Geometrical construction & theorem: division of line segment, parallel lines, similar angles, perpendicular lines, isosceles triangleand right angled triangle.	- Forces definition. - Compressive, tensile, shear forces and simple problems. -Stress,strain, ultimate strength, factor of safety. -Basic study of stress-strain curve for MS.	**42**
2	- Area of cut-out regular surfaces: circle and segment and sector of circle.	- Temperature measuring instruments. Specific heats of solids & liquids.	
3	- Area of irregular surfaces. - Application related to shop problems.	- Thermal Conductivity, Heat loss and heat gain.	
4	- Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple machine blocks.	- Average Velocity, Acceleration & Retardation. - Related problems.	
5	- Material weight and cost problems related to trade.	- Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force	
6	- Finding the value of unknown sides and angles of a triangle by Trigonometrical method.		
7	- Finding height and distance by trigonometry.		
8	- Application of trigonometry in shop problems. (viz. taper angle calculation).		

Fourth Semester
Duration: Six Month(42 Hrs)

Topic No	Workshop Calculation	Workshop Science	Total Hrs.
1	**Graph:** - Read images, graphs, diagrams – bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	- Friction- co-efficient of friction, application and effects of friction in Workshop practice. **Centre of gravity** and its practical application.	**42**
2	Simple problem on Statistics: - Frequency distribution table - Calculation of Mean value. - Examples on mass scale productions. -Cumulative frequency -Arithmetic mean	- Magnetic substances- natural and artificial magnets. - Method of magnetization. Use of magnets.	
3	Acceptance of lot by sampling method (within specified limit size) with simple examples (not more than 20 samples).	- Electrical insulating materials. - Basic concept of earthing.	
4		- Transmission of power by belt, pulleys & gear drive. - Calculation of Transmission of power by belt pulley and gear drive.	
5		- Heat treatment and advantages.	
6		Concept of pressure – units of pressure, atmospheric pressure, absolute pressure, gauge pressure – gauges used for measuring pressure	
7		Introduction to pneumatics & hydraulics systems.	

9.2 EMPLOYABILITY SKILLS (DURATION: - 110 HRS.)

1st Semester

Duration – 55 hrs.

1. English Literacy **Hours of Instruction: 20 Hrs.** **Marks Allotted: 09**	
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on known, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy **Hours of Instruction: 20 Hrs.** **Marks Allotted: 09**	
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets

Computer Networking and INTERNET	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT – ACT, types of cyber-crimes.

3. Communication Skills

Hour of Instruction: 15 Hrs. **Marks Allotted: 07**

Topic	Contents
Introduction to Communication Skills	Communication and its importance
	Principles of Effective communication
	Types of communication – verbal, nonverbal, written, email, talking on phone.
	Nonverbal communication –characteristics, components-Para-language
	Body – language
	Barriers to communication and dealing with barriers.
	Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.
	Triple- A Listening – Attitude, Attention & Adjustment.
	Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success
	The Power of Positive Attitude
	Self-awareness
	Importance of Commitment
	Ethics and Values
	Ways to Motivate Oneself
	Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview
	Do's & Don'ts for an interview
Behavioral Skills	Problem Solving
	Confidence Building

	Attitude

2nd Semester

Duration – 55 hrs.

4. Entrepreneurship skill **Hour of Instruction: 15 Hrs.** **Marks Allotted: 06**	
Topic	**Content**
Business & Consumer:	Types of business in different trades and the importance of skill, Understanding the consumer, market through consumer behavior, market survey, Methods of Marketing, publicity and advertisement
Self-Employment:	Need and scope for self-employment, Qualities of a good Entrepreneur (values attitude, motive, etc.), SWOT and Risk Analysis
Govt Institutions :	Role of various Schemes and Institutes for self-employment i.e. DIC, SIDBI, MSME, NSIC, Financial institutions and banks
Initiation Formalities :	Project Formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment Procedure - Loan Procurement - Agencies - banking Process
5. Productivity **Hour of Instruction: 10 Hrs.** **Marks Allotted: 05**	
Productivity	Definition, Necessity, Meaning of GDP.
Benefits	Personal / Workman – Incentive, Production linked Bonus, Improvement in living standard. Industry Nation.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.

Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health & Environment **Hour of Instruction: 15 Hrs.**	**Marks Allotted: 06**
Safety & Health :	Introduction to Occupational Safety and Health and its importance at workplace
Occupational Hazards :	Occupational health, Occupational hygiene, Occupational Diseases/ Disorders & its prevention
Accident & safety :	Accident prevention techniques- control of accidents and safety measures
First Aid :	Care of injured & Sick at the workplaces, First-aid & Transportation of sick person
Basic Provisions :	Idea of basic provisions of safety, health, welfare under legislation of India
7.Labour Welfare Legislation **Hour of Instruction: 05 Hrs.**	**Marks Allotted: 03**
Labour Welfare Legislation	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's Compensation Act
8.Quality Tools **Hour of Instruction: 10 Hrs.**	**Marks Allotted: 05**
Quality Consciousness :	Meaning of quality, Quality Characteristic
Quality Circles :	Definition, Advantage of small group activity, objectives of Quality Circle, Roles and Functions of Quality Circles in organization, Operation of Quality Circle, Approaches to Starting Quality Circles, Steps for Continuation Quality Circles
Quality Management System:	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping :	Purpose of Housekeeping, Practice of good Housekeeping.5**S** Principles of Housekeeping: SEIRI – Segregation, SEITON – Arrangement, SEISO – Cleaning, SEIKETSU – maintenance of Standards, SHITSUKE - Discipline

DRAUGHTSMAN CIVIL

LIST OF TOOLS & EQUIPMENTS

A. TRAINEES TOOL KIT FOR 20 TRAINEES AND ONE INSTRUCTOR

SL. No.	Name of items	Quantity
1.	Box drawing instrument containing one 15 cm compass with pin point, pin point & lengthening bar, one pair spring bows, rotating compass with interchangeable ink and pencil points, drawing pens with plain point & cross point, screw driver and box of leads.(0.2,0.3,0.4 mm).	21 Nos.
2.	Protractor celluloid 15 cm semi- circular.	21 Nos.
3.	Scale card board- metric set of eight A to H in a box 1: 1,1:2, 1:2:5, 1: 5, 1:10, 1:20, 1:50, 1:100,1:200, 1:500, 1:1000,1:2000,1:1250, 1:6000, 1:38 1/3, 1:66 2/3	21 Nos.
4.	Scales plotting box wood 6 metric scales 30 cms long with offset scales.	21 Nos.
5.	Set square transparent 20 cm, 2 mm thick with bevelled edges 45 degree .	21 Nos.
6.	Set square celluloid 25 cm,2mm thick with bevelled edges 60 degrees.	21 Nos.
7.	T-Square 750mm/Mini drafter/ Parallel Bar	21 Nos.
8.	Template –Architects and builders	21 Nos.

B. GENERAL MACHINERY SHOP OUTFIT:

SL.No.	Name of items	Quantity
1	Geometrical models(wooden/plastic) as per given below: i) Cube 08 cm sides. ii) Rectangular parallel piped 8cmX15cm iii) Sphere 8cm dia. iv) Right circular cone 8 cm dia base and 15 cm vertical height v) Square pyramid 8cm side base and 15 cm vertical height vi) Cylinder 8 cm dia. 15 cm height. vii) Prisms triangular 8 cm sides triangle and 15 cm length.	04 each

	viii) Prism hexagonal 8 cm side's hexagon and 15 lengths	
2	Templates – Circle, Ellipse, furniture, etc.	04
3	French curves - transparent plastic set of 12	04
4	Flexible curves 80 cm long	04
5	Radius curve metric 3 mm to 15 mm	04
6	Brass parallel rulers in a case	04
7	Calculator Scientific (Non-programmable)	04
8	Proportional dividers 15 cm	04

C. LIST OF SURVEYING INSTRUMENTS

SL. No.	Name of items	Quantity
1	Land measuring chain 30 metres with two handles	04
2	Steel tape 30 meters long in a leather case	04
3	Ranging rod wooden fitted iron shoe 2 mt. long	20
4	Steel arrow, wooden peg, wooden mallet, hammer	As required
5	**Prismatic compass** with stand 110 mm dia.	01 set
6	**Plane table** with stand with accessories – alidade, trough compass, spirit level (6"), U – fork, plumb bob, etc	2 sets
7	Telescopic Alidade	01 set
8	Dumpy Level with all accessories	01 set
9.	Auto level With all accessories	02
10.	Levelling staff 4 mt. leading to 5 mt. telescopic type	01 telescopic and 02 straight pieces
11	Transit Theodolite with stand with all accessories	02 sets
12	**Digital Theodolite** latest model With all accessories (Features:-Based on laser technology, Two large LCD panel with easy to read ,Automatically compensates tilt in two direction and compensates vertical angles. High integrated electronic board and IC elements)	02
13	Instrument for **Total Station** with latest model, With all accessories (Graphic LCD display on both side.Multy function key board on both side. Able to interchange data between GPS and Total station without any data conversion. Minimum 8 hours rechargeable li-ion battery .Poles and Prism 2Nos each)	02
14	Hand held **GPS** (latest model) with standard specification	02

D. FOR COMPUTER LAB

SL. No.	Name of items	Quantity
1	Personal computer with latest configuration min. 19 inch LED Screen and graphic card with latest operating system.	20
2	Laptop with latest configuration	02
3	CAD software	20 user
4	Plotter A1 size	01
5	Printer (A3 Laser jet) with scanner (multipurpose)	01
6	Server work station with latest configuration	01
7	Broad Band connection	01
8	UPS 5 KV with 30 min. back up for 20 PC	02
9	Computer Table	20
10	Computer Chair.	20
11	Furniture for server, printer, plotter	01each
12	White Board (6' x 4')	02
13	DLP Projector (2000 lumens or higher)	02
14	First Aid Box	01
15	Screen for Projector (motorized)	02
16	Fire Extinguisher	01
17	Air Conditioner 2.0 Ton	02
18	Wall Clock	01
19	Document Camera / Visualiser	02
21	Smart Board / Inter Active Board	02
22	Steel Cupboard 180 x 90 x 45 cm	02
23	Steel Cupboard 120 x 60 x 45 cm	02
24	Book Shelf	02

E. LIST OF FURNITURE

SL. No.	Name of items	Quantity
1	Trainer's / Instructor's table (big size full secretariat) (6 feet x 4 feet)	01 Nos.
2	Trainer's / Instructor's table	01 Nos.
3	Chair for Trainer / Instructor	02 Nos.
4	Class room chairs (armless)	20 Nos.
5	Class room table single / Dual desk	20 /10 Nos
6	Almirah steel (major) 6" / higher	02 Nos.
7	Drawing table with Board 750mm X 550mm & draughtsman stool	20 Nos.

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :												**Year of Enrollment :**		
Name & Address of ITI (Govt./Pvt.) :												**Date of Assessment :**		
Name & Address of the Industry :												**Assessment location: Industry / ITI**		
Trade Name :		**Semester:**										**Duration of the Trade/course:**		
Learning Outcome:														
Sl. No	**Maximum Marks (Total 100 Marks)**		**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**	**Total internal assessment Marks**	**Result (Y/N)**
	Candidate Name	**Father's/Mother's Name**	Safety consciousness	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA		
1														
2														