SYLLABUS FOR DRAUGHTSMAN CIVIL TRADE			
FIRST YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 56Hrs; Professional Knowledge 12Hrs	Draw free hand sketches of hand tools used in civil work following safety precautions.	1. Importance of trade training, demonstrate tools &equipments used in the trade.(02 hrs) 2. Importance of housekeeping & good shop floor practices. (02 hrs) Occupational Safety & Health : 3. Introduction to safetyequipmentsand their uses. Introduction of first aid. Health, Safety andEnvironment guidelines, legislations & regulations as applicable.(04 hrs) 4. Disposal procedure of wastematerials of the trade. (03hrs) 5. Personal protective Equipments (PPE):-Basic injuryprevention, Basic first aid. (04hrs) 6. Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. (03hrs) 7. Preventive measures forelectrical accidents & steps tobe taken	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. Soft Skills: its importance and Job area after completion of training. Introduction of First aid. Introduction of PPEs. Introduction to 5S concept& its application. Response to emergencies e.g.; power failure, fire alarm, etc. (06 hrs.)

		insuchaccidents. (02 hrs) 8. Use of Fire extinguishers.(08hrs)	
		9. Awareness about the job-sheets made by the ex. Trainees. (02hrs) 10. Use of drawing instruments and equipment with care. (03hrs) 11. Method of fixing of drawing sheet on the drawing board. (03hrs) 12. Layout of different size ofDrawing sheets and foldingof sheets. (06hrs) 13. Draw free hand sketch of hand tools used in civil work.(14hrs)	• Familiarisation& information about rules and regulations of the Institute and Trade. • Overview of the subjects to be taught for each year. • List of the Instruments, equipments and materials to be used during training. (06 hrs.)
Professional Skill 56Hrs; Professional Knowledge 12Hrs	Draw plane figures 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 buildingdrawings. (15hrs) 15. Lines, lettering andDimensioning. (24hrs) 16. Construction of plaingeometrical figures. (17hrs)	• 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. (12 hrs.)
Professional Skill 28Hrs; Professional Knowledge 06Hrs	Construct plain scale, comparative scale, diagonal scale and vernier scale.	17. Drawing of:-Construction of scales – Plain, comparative, diagonal, vernier& scale of cords. (28hrs)	• 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. (06 hrs.)
Professional Skill 56Hrs; Professional Knowledge 12Hrs	Draw orthographic projections of different objects with proper lines, lettering and dimensioning. 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 OrthographicProjection of Line, plane, Solid objects& section of solids. (18hrs) 19. Isometric Projection of geometrical solids. (10hrs) 20. Construction of solid geometrical figures. (10hrs) 21. Oblique and Perspective views of step block. (18hrs)	• 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. (12 hrs.)
Professional Skill 28Hrs; Professional Knowledge 06Hrs	Draw component parts of a single storied residential building with suitable symbols and scales.	Drawing of :- 22. Component parts of a single storied residential building. (in sectional details)Showing Foundation, Plinth, Doors, Windows, Brick work, Roof, Lintel and Chajjah, etc. (28hrs)	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. (06 hrs.)
Professional	Draw different types	23. Draw Details of stone	Protective materials:-

Skill 84Hrs; Professional Knowledge 18Hrs	of stone and brick masonry.	masonryincluding stone joints. (26hrs) 24. Drawing of :-Different types of brick bondingShowing arrangement of bricks in different layers as per thickness of wall, pillars, copying, etc. (58hrs).	• *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. (18 hrs.)
Professional Skill 84Hrs; Professional Knowledge 18Hrs	Draw different types of shallow and deep foundation.	Drawing of Foundation:- Drawing of different types of foundation – Shallow :- 25. Spread Footing. (18hrs) 26. Grillage foundation. (18hrs) Deep - 27. Pile foundation. (18hrs) 28. Raft foundation. (12hrs) 29. Well foundation. (12hrs) 30. Special foundation. (8hrs)	Building Construction:- Foundation:- • Purpose of foundation • 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 (18 hrs.)

Professional Skill 56Hrs; Professional Knowledge 12Hrs	Draw different types of shoring, scaffolding, underpinning, form work and timbering.	Drawing of :- 31. Shoring.(14hrs) 32. Scaffolding.(14hrs) 33. Underpinning. (14hrs) 34. Timbering. (14hrs)	Building Construction:- • Types of shoring and scaffolding in details. • Types of Underpinning and Timbering in detail (12 hrs.)
Professional Skill 56Hrs; Professional Knowledge 06Hrs	Drawing of different types of damp proofing in different position.	Drawing details of treatments in building:- 35. Damp proofing. (06hrs) 36. Anti-termites. (06hrs) 37. Fire proofing. (16hrs)	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 applications. • Weathering course – objectives and materials required. • Fire proofing - effect and rules. (06 hrs.)
Professional Skill 56Hrs; Professional Knowledge 12Hrs	Drawing of different types of arches and lintels with chajja.	Draw different forms of :- 38. Arches. (22hrs) 39. Lintels. (12hrs) 40. Lintels with Chajjahs. (22 hrs)	• Arches: - Technical terms-. types ,centring • *Lintel :*-types,wooden, brick, stone, steel & RCC. • Chajjahs – characteristics, Centring& Shuttering (12 hrs.)
Professional Skill 112Hrs; Professional Knowledge 24Hrs	Perform site survey with chain / tape and prepare site plan. Perfom site survey using prismatic compassand prepare	Surveying:- **Chain Survey :- (55 hrs.)** 41. Equipment and instrument used to perform surveying. 42. Distance measuring with chainand tape. 43. Entering Field book and	*Surveying:-* • Introduction, History and principles of chain survey. • Instrument employed. • Use, care, maintenance and common terms. • Classification, accuracy,

	site plan. Perform site survey with plane table and prepare a map.	plotting. 44. Calculating the area of site. 45. Prepare site planwith the helpof Mouza map. **Compass survey:- (40hrs)** 46. Field work of prismatic compass survey. 47. Plotting of prismatic compasssurvey. 48. Testing and adjusting thecompass. 49. Observation of bearings. 50. Bearing a line. 51. F.B.,B.B., R.B.,W.C.B. of aLine,Traverse and also checkthe close traversing. **Plane Table Survey :- (17hrs)** 52. Surveying of a Building sitewith Plane Table.	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. • 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 (24 hrs.)
Professional Skill 112Hrs; Professional Knowledge 24Hrs	Make tropography map by contours with leveling instruments.	***Levelling*:-** (112 hrs.) 53. Handling of levellinginstruments& their settings 54. Temporary adjustment of alevel. 55. Simple levelling. 56. Differential levelling (Fly levelling). 57. Carry out Levelling field book. 58. Equate Reduction of levels – Height of collimation and Riseand Fall method – Comparisonof methods. 59. Solve problems on reduction	*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,

		of levels. 60. Calculate Missing data and how to fill it up–calculations &Arithmaticalcheckin 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 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.	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. (24 hrs.)
Professional Skill 84 Hrs; Professional Knowledge 18 Hrs	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 56hrs) 77. Setting out work- Building,culvert, centre line of Dams,Bridges and Slope	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.

		of Earth work, etc. (28hrs)	• 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. (18 hrs.)
Professional Skill 56Hrs; Professional Knowledge 12Hrs	Drawing of different types of carpentry joints. Draw different types of doors and windows according to Manner of construction, Arrangement of component, and working operation	Making detailed drawing of :- 78. Carpentry joints:- lengthening, bearing, housing, framing, panelling&moulding. (22hrs) 79. Different Types doors including panelled, glazed and flush door. (22hrs) 80. Different types windows and ventilators. (12hrs)	• Carpentry joints :- terms,classification of joints, Uses, types of fixtures , fastenings. • Doors –Parts, Location, standard sizes, types. • *Windows*-types. • *Ventilators*-purpose-types. (12 hrs.)
Professional Skill 28Hrs; Professional Knowledge 06Hrs	Prepare the detailed drawing of electrical wiring system.	Electrical Wiring:- Prepare drawing of 81. Wiring in different system.(08hrs) 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. (06 hrs.)
Professional Skill 56Hrs;	Draw types of ground and upper floors.	Drawing details of:- 83. Types of ground & upper	• Floors – Ground floor & upper floor-Types.

Professional Knowledge 12Hrs		floors. (28 hrs) 84. Various floor finishing, sequence of construction. (28hrs)	• Flooring- materials used types. (12 hrs.)
Professional Skill 56Hrs; Professional Knowledge 12Hrs	Draw different 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. (18hrs) 86. As per material - brick, stone, wooden, steel & RCC stairs. (20 hrs) 87. Drawing of Lift and Escalator. (18hrs)	• Stairs:- Terms. Requirements,Planning and designing of stair and details of construction. • Basic concept of lift and Escalator (12 hrs.)
Professional Skill 84Hrs; Professional Knowledge 18Hrs	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. (32hrs) 89. Steel roof trusses showing detailed connections. (30hrs) 90. Wooden roof truss, showing detailed connections. (22hrs)	Roofs & Roof coverings: – • purposes,Elements, Types, Fla, 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. (18 hrs.)
Project work / on the job training **Broad area :-** (a) Prepare site map using chain/prismatic compass/plane table / leveling instrument/ theodolite. (b) Prepare innovative drawing/model of doors/ windows. (c) Prepare innovative drawing/model of vertical movement/roofs.			

SYLLABUS FOR DRAUGHTSMAN CIVIL TRADE			
SECOND YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 56Hrs; Professional Knowledge 16Hrs	Draw single storied Building site plan layout.	Drawing details of:- 91. Single storied residential house with attached bath of both pitched and flat roof. (12hrs) 92. Making plan, elevation, and section with aid of line diagrams of the building. (26hrs) 93. Layout and detailing of residential building. (06hrs) 94. Create a drawing of building showing set backs. (06hrs) 95. Showing layout plan and key plan. (06hrs)	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. (16 hrs.)
Professional Skill 56Hrs; Professional Knowledge 16 Hrs	Create objects on CAD workspace using Toolbars, Commands, Menus, formatting layer and style.	Computer practice:- 96. Function of keys and practice of basic commands. (06hrs) 97. Use of elementary commands by CAD toolbar. (06hrs) 98. Creation of objects in different layers on CAD workspace. (10 hrs) 99. Plotting of drawing from CAD. (02hr) 100. 2D drafting of flash door, panel door, window, hand railing, wash basin, sewerage pipe joints, etc.	Computer aided drafting:- • Operating system ,Hardware& software. • Introduction of CAD. • Its Graphical User Interface. • Method of Installation. • Basic commands of CAD. • Knowledge of Tool icons and set of Toolbars. • Knowledge of shortcut keyboard commands. (16 hrs.)

		(20 hrs) 101. Preparing Library folder by creating blocks of the above items. (12hrs)	
Professional Skill 112 Hrs; Professional Knowledge 32 Hrs	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. (32hrs) 103. A Reading room with R.C.C flat roof. (06hrs) 104. A House single storeyed residential building with single bed room and attached bathroom with R.C.C. flat roof slab. (18hrs)	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. (16 hrs.)
		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. (12 hrs.) 107. Two roomed house with RCC slope roof with gable ends. (12 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 Positioning layout of Furniture, Electrical appliances and plumbing	Prefabricated Structure:- • Preparation. • Method of construction, assembling. • Advantages & disadvantages. (16 hrs.)

		/ sanitary fittings. (12 hrs.)	
Professional Skill 28Hrs; Professional Knowledge 08Hrs	Create objects on 3D modeling concept in CAD.	3D modeling in CAD :- (28hrs) 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. (08 hrs.)
Professional Skill 56Hrs; Professional Knowledge 16Hrs	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. (06 hrs.) 119. A small Restaurant building with R.C.C flat roof. (06 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)	• *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. (16 hrs.)

		over R.C.C. Columns. (12 hrs.) 122. Service plans. (06hrs) 123. A Bank building with R.C.C flat roof. (06hrs)	
Professional Skill 56Hrs; Professional Knowledge 16Hrs	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). (20hrs) 125. Lintel, chajjas&slabs.(16hrs) 126. Stair - details of step. (20hrs)	Reinforced cement concrete structure:- • Introduction to RCC uses. • Materials – proportions • Form work • Bar bending details as per IS Code. • Reinforced brick work. (16 hrs.)
Professional Skill 84Hrs; Professional Knowledge 24Hrs	Prepare detailed drawing of RCC structures using CAD and prepare bar bending schedule. 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. (12hrs) 128. Details of one-way slab & two-way slab. (20 hrs) 129. T-beam, Inverted beam, cantilever, retaining wall, Lift well. (16 hrs) 130. Column with footing. (12hrs) 131. Continuous columns showing disposition of reinforcement. (12hrs) 132. RCC framed structure, portal frame, B.I.S. Code 456-2000, SP - 34 and its application. (12hrs)	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. (24 hrs.)
Professional	Draw the different types of steel sections, rivets	Drawing of different types of:- 133. Steel sections,	Steel structures:- • Conmen forms of steel

Skill 56Hrs; Professional Knowledge 16Hrs	and bolts using CAD. Draw the details of girders, roof trusses and steel stanchions using CAD	rivet,bolts,etc. (16 hrs) 134. Section and elevation of girders. (12hrs) 135. Structural Joints. (12hrs) 136. Plate girders roof trusses, stanchion etc. (16hrs)	sections. • Structural fasteners , Joints. • Tension & compression member. • Classification, fabrication. • Construction details. (16 hrs.)
Professional Skill 84Hrs; Professional Knowledge 24Hrs	Prepare the detailed drawing showing the different types of sanitary fittings, arrangements of manholes, details of septic tank using CAD. Draw the details flow diagram of water treatment plant (WTP) and Swerage Treatment plant (STP).	Public Health & Sanitation. 137. Drawings of showing various pipe joints for underground drainage. (12hrs) 138. Types of sanitary fittings in multi-storeyed building. (12hrs) 139. Manholes and septic tank. (16hrs) 140. Water supply system. (10hrs) 141. R.C.C square overhead tank supported by four columns. (12hrs) 142. Preparation of service plan(drainage plan)for isolated building & in sewer system. (10 hrs) 143. Drawings of toilet fixtures. (06hrs) 144. Flow diagram of water treatment plant (WTP) and Swerage Treatment plant (STP). (06hrs)	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 (24 hrs.)
Professional Skill 84Hrs; Professional Knowledge	Draw the cross sectional view of different types of roads showing component parts using CAD.	**Roads:-** 145. Draw showing road structure and component parts. (28hrs) 146. Prepare a drawing of	**Roads:-** • Introduction. • History of highway development. • General principles of

24Hrs		Cross-sections showing the different types of roads-accordingto location & materials. (32hrs) 147. Prepare a drawing of road curves & gradient. (24hrs)	alignment. • Classification and construction of different types of roads, • Component parts. • Road curves, gradient. • 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. (24 hrs.)
Professional Skill 56Hrs; Professional Knowledge 16Hrs	Draw the details of different types of culverts using CAD Prepare detailed drawing a bridge using CAD	**Bridge &Culvert :-** Prepare drawing of - 148. Different types of culvert. (10hrs) 149. Preparing drawing of an arched bridge. (10 hrs) Draw plan and sectional views of the following:- 150. R.C.C Slab Culvert with splayed wing walls. (12hrs) 151. Steel Foot over bridge across a highway. (12hrs) 152. Two span Tee Beam Bridge with square returns. (12hrs)	**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. (16 hrs.)
Professional	Draw the typical cross	**Railway:-**	**Railways :-**

Skill 56Hrs; Professional Knowledge 16Hrs	section of rail sections, railway tracks in cutting and embankment using CAD	153. Draw typical cross section of rail track. (06hrs) 154. Draw Railway tracks – embankment layout plans of railway platform. (22 hrs) 155. Draw typical cross-section of railway tracks cutting & embankment (single lane & double lane). (22hrs) 156. Draw layout of signalling points & crossing. (06 hrs)	• 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. (16 hrs.)
Professional Skill 112Hrs; Professional Knowledge 32Hrs	Prepare detailed drawing of typical cross sections of Dam, barrages, weir and Cross drainage works using CAD Draw the schematic diagram of different structures of Hydro electric project using CAD	**Drawing of different types of irrigation structures: –** 157. Dams, barrages, weir etc. (18hrs) 158. Longitudinal section of distributaries with the help of given sketch & data. (18hrs) 159. Head regulators. (15hrs) 160. Types of cross drainage work. (18 hrs.) 161. Hydro electric project.	**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, kharifetc. • Storage, diversion head work -characteristics and types.

		(18hrs) **Drawing of canal** 162. Alignment including longitudinal and cross sections of canals with the given data. (25 hrs)	• 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. (32 hrs.)
Professional Skill 112Hrs; Professional Knowledge 32Hrs	Prepare detailed estimate and cost analysis of different types of building and other structures using application software. Prepare rate analysis of different items of work. Problems on preparing preliminary/Approximate estimates for building project.	**Estimating and Costing:-** **(visualizing the plotted drawing)** 163. Prepare detailed Estimate :-Calculate quantities of items of single storied and double storied building. (18 hrs.) 164. Prepare abstract of estimate by prevailing rates. (14 hrs.) 165. Prepare rate analysis of major items - RCC, PCC, Wood works, Stone & Brick masonry & Plastering. (20hrs) 166. Solve problems on preparation ofpreliminary /	**Estimating and Costing** :- • Introduction. • Purpose and common techniques. • Drawing of construction. • Measurement techniques. • Estimate-necessity, 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.

		approximate estimates for building projects by Excel worksheet as per Govt. schedule. (20hrs) 167. Familiarisationwith and making estimation with software. (20 hrs) 168. Estimate earthwork of irregular boundaries. (20 hrs)	• Labour and materials. • Govt. Schedule of rate. • Estimating of irregular boundaries by trapezoidal and Simpsons formula. (40 hrs.)
Professional Skill 56Hrs; Professional Knowledge 16Hrs	Prepare a map using Total station.	**Total Station:-** 169. Application of survey using TS. (06hrs) 170. Field procedure for co-ordinate measurement. (06hrs) 171. field procedure to run open traverse and closed traverse. (04hrs) 172. Transfer or establish Bench Mark. (03hrs) 173. Perform stakeout / demarcation of building layout /plot layout/ roads/ alignment. (08 hrs.) 174. Measure remote distance and elevation. (10 hrs) 175. Calculate surface area on field/site. (03hrs) 176. Calculate volume of field/site. (03hrs) 177. Procedure for down load and up load data. (06 hrs) 178. Simple survey map using Auto CAD. (07hrs)	**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. (16 hrs.)
Professional Skill 56Hrs;	Locate the station point using GPS and obtain a set of co-ordinates.	**GPS Awareness:-** 179. Practical application of GPSComponents of GPS	**GPS (Global Positioning System):-** • Introduction of GPS

Professional Knowledge 16Hrs		data processing.GPS signal. 180. Code and biasesTechniques of GPS observing. 181. Set up and use GPS equipment. – (Total – 18 hrs) 182. Use GPS for a static survey (STK), in real time(RTK) mode.Record and process results to obtain a set of co-ordinates. (32hrs) 183. Compare with GPS, GIS,GNSS& CAD. (06hrs)	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. (16 hrs.)
Project work / on the job training Auto CAD 3D modelling with rendering (material, light, shadow, etc.) **Broad Area :-** (a) Prepare project drawing of Roads with cross sectional views showing different components using CAD. (b) Prepare detail project drawing of Culvert/ bridge using Auto Cad 3D modeling with rendering. (c) Prepare project drawing of Dam/ barrage/Weir with cross sectional views using Auto CAD 3D modeling with rendering.			