Syllabus for the trade

of

SURVEYOR

(SEMESTER PATTERN)

under

CRAFTSMAN TRAINING SCHEME

Designed in 2013

By
Government of India
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
Directorate General of Employment & Training
Ministry of Labour & Employment
EN-81, Sector-V, Salt Lake City,
Kolkata-700091

List of members of Trade Committee meeting for the Trade of **"SURVEYOR"** held on 17-10-2011, at Advanced Training Institute Kolkata.

Sl.No	NAME& DESIGNATION S/SHRI	REPRESENTING ORGANIZATION	REMARKS
1	N. K. Chatterjee,Director	A.T.I.Kolkata	Chairman
2	J.Ukil. Jt.Director	A.T.I.Kolkata	Member
3	G.C.Saha,ADT	A.T.I.Kolkata	Member
4	Prasanta Kumar Paul,JE	CPWD,Kolkata	Member
5	A.K.Kolay,Asst.Engg.	CPWD,Kolkata	Member
6	Saikat Dutta	Project Manager, M/s Unit Construction Co.(P) Ltd. Kolkata	Member
7	A.K.Dutta,ADT	A.T.I.Kolkata	Member
8	A.K.Mondal,ADT	A.T.I.Kolkata	Member
9	Sk.A.Hossain,T.O	A.T.I.Kolkata	Member
10	A.K.Naskar,T.O	A.T.I.Kolkata	Member
11	Soma Das,V.I	R.V.T.I.(W),Kolkata	Member
12	Manika Banerjee,	Don Bosco,SERI	Member
13	Abhijit kr.Porel	Representation of Govt. of W.B	Member
14	Debasis Hari,D/M(Civil)	Representation of Govt. of W.B	Member
15	P.K.Madavi,	CTI,Chennai	Member
16	Pradip Kumar Sarkar,Ins.	Representation of Govt. of W.B	Member
17	Somnath Adhikari	Consulting Engineer	Member
18	Goutam Nandi,	CSTARI,Kolkata	Member
19	Tapan Kumar Halder	ATI,Kolkata	Member
20	S.Rana,V.I	ATI, Kolkata	Member
21	Subrata Saha	Representation of Govt. of W.B	Member

List of members attended the Workshop to finalize the syllabi of existing CTS into Semester Pattern held from 6th to 10th May' 2013 at CSTARI, Kolkata.

Sl. No.	Name & Designation	Organisation	Remarks
1.	R.N. Bandyopadhyaya, Director	CSTARI, Kolkata-91	Chairman
2.	K. L. Kuli, Joint Director of Training	CSTARI, Kolkata-91	Member
3.	K. Srinivasa Rao, Joint Director of Training	CSTARI, Kolkata-91	Member
4.	L.K. Muhkerjee, Deputy Director of Training	CSTARI, Kolkata-91	Member
5.	Ashoke Rarhi, Deputy Director of Training	ATI-EPI, Dehradun	Member
6.	N. Nath, Assistant Director of Training	CSTARI, Kolkata-91	Member
7.	S. Srinivasu, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
8.	Sharanappa, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
9.	Ramakrishne Gowda, Assistant Director of Training	FTI, Bangalore	Member
10.	Goutam Das Modak, Assistant Director of Trg./Principal	RVTI, Kolkata-91	Member
11.	Venketesh. Ch. , Principal	Govt. ITI, Dollygunj, Andaman & Nicobar Island	Member
12.	A.K. Ghate, Training Officer	ATI, Mumbai	Member
13.	V.B. Zumbre, Training Officer	ATI, Mumbai	Member
14.	P.M. Radhakrishna pillai, Training Officer	CTI, Chennai-32	Member
15.	A.Jayaraman, Training officer	CTI Chennai-32,	Member
16.	S. Bandyopadhyay, Training Officer	ATI, Kanpur	Member
17.	Suriya Kumari .K , Training Officer	RVTI, Kolkata-91	Member
18.	R.K. Bhattacharyya, Training Officer	RVTI, Trivandrum	Member
19.	Vijay Kumar, Training Officer	ATI, Ludhiana	Member
20.	Anil Kumar, Training Officer	ATI, Ludhiana	Member
21.	Sunil M.K. Training Officer	ATI, Kolkata	Member
22.	Devender, Training Officer	ATI, Kolkata	Member
23.	R. N. Manna, Training Officer	CSTARI, Kolkata-91	Member
24.	Mrs. S. Das, Training Officer	CSTARI, Kolkata-91	Member
25.	Jyoti Balwani, Training Officer	RVTI, Kolkata-91	Member
26.	Pragna H. Ravat, Training Officer	RVTI, Kolkata-91	Member
27.	Sarbojit Neogi, Vocational Instructor	RVTI, Kolkata-91	Member
28.	Nilotpal Saha, Vocational Instructor	I.T.I., Berhampore, Murshidabad, (W.B.)	Member
29.	Vijay Kumar, Data Entry Operator	RVTI, Kolkata-91	Member

GENERAL INFORMATION

1. Name of the Trade : **SURVEYOR**
2. NCO Code No : 842.10, 842.15
3. Duration : Two year (Four semesters having
4. each of six months Duration)
5. Power Norms : 2 Kw.
   Space : 64 Sq. Mtrs
6. Entry Qualification : Passed 10th class examination under 10+2 system of education with Science and Mathematics or its equivalent.
7. Unit Size (No. Of students) : 16
8. Instructor's/Trainer's Qualification:

a) Degree or Diploma in Civil or Architectural Engineering with 1 or 2 years post qualification experience respectively.

Or,

NTC in the relevant trade with 5 years post qualification experience.

Or,

NAC in the relevant trade with 4 years post qualification experience.

b) Desirable Qualification: Preference will be given to a candidate with Craft Instructor Certificate..

* **Note:** At least one Instructor must have Degree or Diploma in Civil or Architectural Engineering.

Syllabus for the trade of "Surveyor" under
C.T.S. Duration: Six Month
First Semester

Semester code:- SUR:SEM-I

Week no	Trade practical	Trade theory	Workshop Cal. & Science
1.	Familiarization with institute and importance of the trade training. Instruments and equipment used in the trade, type of work done by the trainees in the institute, nature of job done by the trainees of the surveyor.	Importance of safety and general precautions observed in the Institute and in. the section. Importance of the trade in development of industrial economy of the country. Related Instructions, subjects to be taught - Achievement to be made. Recreational and medical facilities and other extra curricular activities of the institute (AJ! necessary guidance to be provided to the new comers to be come familiar with the working of industrial training institute, system of including store procedure).	----------
2	Drawing different types of lines, lettering different types.	Uses of Instrument box, board, Tee- Square, Set square, Protractors and other instrument used for survey drawing, their types and uses.	----------
3	Printing of letters and figures of different types.	Printing of letters and figures by different methods of inking of letters using stencil, colouring.	Addition, substraction of decimal fraction.
4&5	Construction of plain, comparative diagonal and vernier scales.	Scales - different types, their principle method of construction and reading, calculating least count.	Multiplication and division of decimal and fraction. Conversion of decimal into vulgar fraction and vice versa.
6,7 & 8	Geometrical drawing problems on lines, angles, triangles,	Geometrical constructions lines, angles, triangles, conic	Fundamental algebraic formula for multiplication and factorization.

	quadrilaterals etc. Drawing conic section cone.	sections, quadrilaterals, polygons, circles/ellipse, parabola & hyperbola.	
9&10	Drawing of conventional signs used in Engineering survey, cadastral survey. Topography and building drawing - practice in map reading including contours and drainage. Use of legends.	Surveying - their classifications, plane survey, geodetic survey, different purpose of survey - instruments used in survey. Nature of surveyors work - importance of system. Accuracy and speed in field and office work. Common terms and definitions used in surveying conventional signs used in field book and survey maps. Use of Legends.	-do-
11	Practice in unfolding and folding chain, Errors & adjustment of chains, alignment of chain/error chaining lines - measurements of distance between given points and their booking.	Linear measuring instrument used by surveyors, their description arid uses. Types of chain.	Simple and simultaneous equations.
12,13	Practice in chaining and taking off-set, use of optical square and cross staff setting out right angles-booking of measurements testing of chain, tape, optical square and cross staff.	Chain survey and principles location of points-off-sets and instrument used for the same, their descriptions testing of the chain, tape, cross staff and optical square.	Simple theory of indices, simple and simultaneous equations.
14	Procedure in conducting chain survey reconnaissance preparation of rough sketch selection of base lines and station points - fixing of stations etc.	Procedure in conducting chain survey - preliminary steps-conditions to be satisfied by survey lines.	Surds, simple and simultaneous equation of the first degree.
15	Chain survey of small plots by triangulation, booking and plotting the same.	Field book types-methods of entry of check lines-its importance.	-do-

16	Chain survey of built up plots, locating details, booking and plotting the same.	Location of details - types of off-sets and their limit- town survey traversing with chain procedure in plotting chain lines , skeleton, its check and filling in details.	Quadratic equations and its applications.
17	Taking horizontal measurements on sloping ground over coming obstacles in chaining and aligning measuring distance between two points one of which is invtssible or inaccessible from the other.	Measurements on undulated sloppy ground types of obstacles in chaining and method of overcoming them. Care and maintenance of chain and its accessories	-do-
18	Chain survey of an extensive area, locating details plotting and ink and colour.	Errors in chain survey and their remedies, problems in chain survey- degree of accuracy required in chain survey and its relevant to field work. In field work- procedure in inking and colouring.	-do-
19	Surveying of a tank, a route or obstructed field by chain traverse, height of inaccessible objects by using chain and its accessories.	Use of magnetic needle in survey works - types of compasses - description, constructional features and uses of surveyor" s compasses and their adjustment measurement of directions.	Linear graph. Use of common logarithms tables.
20	Achievement test in chain survey.	Discussion of evaluation scripts.	-do-
21	Practice in setting up a compass and checking its accuracy - taking bearings and calculating angles.	Technical terms used in compass survey, difference between angles and bearings-magnetic and true meridians- declination and its variations, local attraction, its detection, and elimination.	-do-

22&23	Determining the bearings of a given line and establishing lines of given bearings - laying out a recti-linear and - polygonal plots of ground using a compass and a tape.	Method of locating details by bearings, method of survey with compass-traversing methods. Methods of determining true meridians and declination - methods of plotting closed compass traverse - adjustment of closing errors - limits of precision required — field book entries.	-do-
24	Conducting closed traverse of built up fields and plotting the same.	Relaying of old service errors in compass survey. Testing and adjustment of compass.	Properties of plain geometrical figures – triangles, rectangle and quadrilaterals.
25	Project Work / Industrial visit (optional)		
26	Examination		

Syllabus for the trade of "Surveyor" under C.T.S.
Duration: Six Month
Second Semester

Semester code:- SUR:SEM-II

Week No.	Trade Practical	Trade Theory	Workshop cal. & science
1&2	Surveying and extensive built up area with compass booking plotting -finish in ink and colour.	Plane table survey advantage and dis-advantages of plane table survey-equipment in plane table surveying, general instruction for plane table survey.	Properties of regular polygons, circles parallelogram, parabola and ellipse.
3	setting up of plane table leveling, centering and orientation.	Methods of plane tabling - radiation - intersection - traversing - resection.	-do-
4	Surveying an area with plane table by radiation and intersection methods.	Two point and three point problems triangle of error and its elimination - Lehman's rule - mechanical and graphical method	-do-
5&6	Traversing with plane table of built up areas.	Errors in plane tabling and their elimination instruments used in combination with plane tabling, their construction and use.	Determination of sides, area of triangle, quadrilateral & polygons.-do-
7	Running and open traverse with plane table and fixing details.	Tangent clinometers (Indian pattern clinometers), Delescles clinometers, telescopic alidade.	-do-
8	Inking, finishing, colouring and tracing of plane table maps done in previous weeks	--do--	-do-
9&10	Practice in finding the position of the tabie by three point and two point problems and locate. Use of tangent clinometer-Dolesole's clinometer- Abney level for finding height of various surrounding points - use of telescopic alidade in fixing heights of surrounding points.	Survey maps - care and maintenance at plane table accessories, procedure of plane tabling.	-do-
11	Practice in setting out a level and performing temporary adjustments - practice in reading staff.	Leveling survey - the level parts, kinds - types of levels -Cook's reversible level and dumpy level - their construction and parts - types of diaphragm. Types of leveling staff, their description and use-technical terms used in	Determination of area of circles, sectors, segments and ellipse, simpson's rule.

12	Demonstration of permanent adjustment of level	Permanent adjustment of various leveling instruments, repeating the same with precautions.	-do-
13-16	Practiced in differential leveling, including reciprocal leveling and establishing bench marks, reading of inverted staff practice in booking, and reduction checking level reading in height of coiiimaiion and rise and fall systems.	Methods of observation, booking and reduction of levels, forms of levels, forms of field books for leveling and methods of entry rules for checking up readings and calculation. Reciprocal leveling - effect of earth* s curvature and refraction in leveling. Common sources of errors in leveling and their elimination-degree of accuracy in leveling. Introduction to contour.	Surface area and volumes of rectangular parallelopoids, cylinders, pyramids and spheres. Units of force and weight. Equation of motion.
17-18	Performing permanent adjustment to various types of leveling instruments.	Working out problems on field book reduction, reciprocal leveling and permanent adjustments.	Magnet and magnetism. Laws of magnetic attraction and repulsion
19	Establishing of alignment and grade for roads and drains. Method of entering in the field books.	Classification of leveling staffs. Purpose of sectioning, consideration of distance between points, precautions.	Magnetic substance – permanent magnet.
20-22	Carrying out route survey longitudinal & cross section of a road project - its ploting and calculation of earth work.	Steps in plotting sections - selection of scales - factors affecting selection of formation level - prismoidal formula and its application, calculation of earth work.	Magnetic field and line of force proportions of magnetic lines of force.
23-24	Practice in use of boning rods and ghat tracer for establishing grade lines for various types of	Construction and use of boning rods and ghat tracer.	Magnetism and its natural ore.
25	work.	Project Work / Industrial visit (optional)	
26	Examination		

Syllabus for the trade of "Surveyor" under C.T.S.
Duration: Six Month
Third Semester

Semester code:- SUR:SEM-III

Week No.	Trade Practical	Trade Theory	Workshop cal.& science
1-3	Road project - reconnaissance, preliminary and final location survey including preparation of route map to scale, taking profile and section with level plotting, marking formation levels- calculation of earth work and other materials for laving road including estimation of earth work.	Types of surveys for the location of a road, points to be considered during reconnaissance, preliminary and final location surveys. Alignment of roads - relative importance of length of road height of embankment and depth of cutting - road gradients - sub grades and road foundations, drainage camber curves and super elevation, road surfaces, such as earth road, water bound macadam cement contrete payment	Kinds of magnet and system of magnetization. Revision on magnetism. Trigonometric ratios and functions of multiple angles functions of sub-multiple angle and compound angles radian measurement and relation between system of measurement of angles – formula connecting sides, angles and areas of triangles.
4-5	Practice in setting up a theodolite and taking readings.	Introduction to theodolitye. Temporary adjustment of theodolite-procedure in setting up - methods of measurement of horizontal angles - repetition and reiteration systems. .	Solutions of simple triangles.
6-7	Measurement of horizontal angles by repitition, reiteration methods - method of entering the same in the field book - setting' out given angles.	General forms of field notes used in theodolite surveys - adjustment of errors while laying a given angle by repitition. Method of setting out straight lines establishing lines at given angles with given lines.	-do-
8	Practice in measuring vertical angles, setting out given vertical angles and entering in the field book.	Instrumental errors and— elimination - permanent adjustments of theodolite care and maintenance of theodolites.	Problems of height and distance.
9	Demonstration of permanent adjustment of theodolite.	Method of running a traverse - different methods of angles and bearings.	-do-

10-11	Setting out a straight line over and across obstacles prolonging straight lines establishing lines at given angles with given lines - setting out on around given rectilinear figures.	Methods of plotting traverses - Gales traverse system-checking of measurements of closed and open traverse-use of traverse tables (chambers and boilean) closing errors and its adjustment.	Use of mathematical tables.
12	Running a closed traverse over a given area, booking calculating the coordinates and plotting the traverse.	Omitted measurements and their calculation - practice in working out problems.	Revision of trigonometry.
13	Running an open traverse, calculate and plot the same and fix the details with plane table measuring a base line for triangulation.	Technical terms in connection with simple triangulation -base line measurements and its correction - procedure of measuring angles - methods of calculating sides from triangulation, data check, errors and precautions.	Surface area and volumes of cylinders.
14	Practice in performing permanent adjustments of theodolite.	Methods of calculating area of a closed traverse from coordinates.	Surface area and volumes of prisms. Prisomoidal formula.
15	Finding height and distances of accessible and inaccessible objects with theodolite and chain and calculating the same, use of box sextant.	Working out problems on finding out areas of closed traverses, height and distances - box sextant, its description and use. Abney's level and its description.	Surface area and volumes of pyramids. Prisomoidal formula.
16.	Practice on THEODOLITE and adjustment of it.		
17.	Contouring by spot level method including interpolation .	Topographic survey and principle – instruments and accessories used in topographic survey-contours and their characteristics.	Surface area and volumes of sphere.
18.	Contouring by cross – section method including interpolation of contours (Grid method)	Vertical intervals horizontal equivalents methods of determining counters-comparison of different methods and their application	Surface area and volumes of cone.

19.	Direct contouring using levels for vertical control, plane table and telescopic alidade for horizontal control.	Interpolation of contours by different methods and preparing contour maps – preparation of field record for topographic surveys – height book –height tracing and colour trace.	Revision of whole mensuration work.
20-21.	Conducting topographic survey of undulated area by theodolite triangulation and plane table resection and intersection method using Indian pattern clinometers.	Different method of finding area of irregular figures-planimeter – its principle, construction, use of precaution – working out problems of areas by using planimeter enlarging and reducing of plans use of proportions, compass and pantographs and their parts .	Elementary theory of light.
22	Carrying out topographical survey with help of theodolite levels and tape of a site of reservoir cross-sectional drawing of different canals.	Types of supply of water- rain fall attachment areas, run off over best side for construction a reservoirs, water spread area factors affronting the considera-tion of the height of dams and capacity of reservoirs.	Laws of reflection, refraction mirrors and lens.. properties of mirrors and lenses, achromatic combination of lenses, description and use of optical instruments such as telescopic sextants etc.
23-24.	**Survey camps:-** In any suitable hilly place 2 week, carrying out contour direct and indirect contour survey of a small area by tachometer working out proposed alignments on contour maps (project work) on various curves and calculation , marking of alignment of road on it. Direct contour and indirect contour.		-do-
25	Preparation and submission of above Project Work report. Or Industrial visit (optional)		
26	Examination		

Syllabus for the trade of "Surveyor" under C.T.S.

Duration: Six Month

Fourth Semester

Semester code:- SUR:SEM-IV

WEEK NO	Trade Practical	Trade Theory	Workshop cal. & science
1	Setting out of simple curves by chain and tape with different methods setting out of curves by deflections methods with and without obstacles.	Working problems on simple curves by chain and tape offset method and successive by section of arch.	Properties of mirrors and lenses, achromatic combination of lenses, description and use of optical instruments such as telescope, sextant etc.
2	Setting out of compound curves, transition curves with theodolite.	Compound curves working problems on compound curves and types of transition curves.	-do-
3	Setting out of vertical curves.	Different types of vertical curves and its working problems. Parts of pantigraphs and planimeter with their uses.	-do-
4	Reducing and enlarging the plan by peniagraph and area by planimetre.	-do-	-do-
5,6	Measurement off- set of obstructed lines, measurement of field both in the triangle and off-set system base line system, fixing, missing, land demarcation.	Methods of taking off-sets on obstructed lines and offset lines, field measurement in triangle and offset system. Method of fixing survey maps on boundaries.	Some common terms from astronomy essential for surveyor.
7 ,8	To find the true north by transfer to camp observing stars and sun (current) with the help of Nautical Almanac. (Camp is preferable)	Astronomical surveying introduction. Definition of spherical triangle. Astronomical triangle observation of sun and stars. Calculation for Azimuth and time. Coordinate System and its conversion of mean solar time into side real time or vice versa. Determination of the meredian and Azimuth.	Load, elongation, stress and strain, hook's law.

9	Testing plotting of (1:4000) village map and locating errors in measurements.	Procedure in typing field numbers, printing names and inter-setting topographical details in maps.	Modulus of elasticity elastic limit and yield point.
10	Typing field numbers, printing names and inserting topographical detail in maps- comparison of field and village boundaries and side measurements.	Comparison of field and village boundaries and side measurements procedures to prepare of transfer paper and transfer drawings- Lithography - incography Vandyke process, cordography.	Ultimate stress and breaking stress. Problems on the above.
11	Tracing and inking taluk, district and state maps - Grossery of terms tracing of maps observation of substance bar and its calculation.	Convergency of meridian - substance bar and its use. Grossery of terms.	Bending moment, shear force their definitions and calculations thereof.
12,13	Azimuth observation and computation-Computation of latitudes and azimuths, Solution of spherical triangle. Record of Rights.	Computation of latitudes and azimuth, solution of spherical triangles - computation of spherical triangles, values of village tri-junctions, maps- projection methods of reducing values of points from one origin to other. Land laws & rules.	-do-
14 to 20	i) Elementary (Window operating system) ii) Knowledge of Editor. iii) How to install Auto-CAD. iv) How to load Auto-CAD v) Elementary command of Auto-CAD vi) Knowledge of window software, vii) M.S.Office. viii) Operating system Software	i) What is computer. General terms used in computer. ii) MS-Word and their uses. iii) M.S.Office. iv) Operating System Software v) Window command and their uses. vi) Auto CAD Commands and use of different Menus of Auto-CAD	-do-

	ix) Working practice on Auto-ACD x) Latest survey software Working with internet browser to locate and access technical information about map and survey.	Knowledge about internet and uploading and downloading of maps and information about land survey	
21	Types of bonds plan section and elevation of 115 mm and 340 mm thick wall detailed drawing of parts of a building such a brick arch stone masonry. Drawing of king and queen posts trusses, simple doors and simple RCC structural parts.	Types of bonds, English bond, Flemish bonds, Tee joints, wall junctions, stone masonry, random rubble, coarsed and Aslar stone masonry. Type of Arch, king post and queen post, doors & windows RCC simple beems and lintel.	Different units conversion of units of areas, volumes & relating related to surveying.
22 to 23	Drawing plan elevation and section of simple building simple building by measurements, plan section and elevation. Setting out a simple building and simple culvert on the ground from given drawing.	Glossary terms of building construction, building materials and roads irrigation.	Estimation of simple building.
24	Total station survey(Digital Theodolite)		-do-
25	Revision		
26	Examination		