

SYLLABUS OF SEMESTER SYSTEM
FOR THE TRADE OF
SURVEYOR

Under
Craftsmen Training Scheme (CTS)
(One Year/Two Semesters)

Redesigned in
2014

By
Government of India
Ministry of Labour & Employment
Directorate General of Employment & Training (DGE&T)

GENERAL INFORMATION

1. Name of the Trade : **SURVEYOR**
2. NCO Code No. : 842.10, 842.15
3. Qualification Pack Code : :
4. Duration of Craftsmen Training : Two Semesters (1Year)
5. Entry Qualification : Passed 10th Class under 10+2 system.
6. Unit Strength : 20
7. Space Norms : 64 Sqm
8. Power Norms : 3 KW (20000 lumen)
9. Job Role : 1. To conduct survey of any type of land using chain, compass, cross staff, plane table, level, theodolite and other survey instruments.
2. To perform construction survey using modern survey instruments.
10. Instructor's Qualification : NTC/NAC in the relevant trade with 3 years' post qualification experience
OR
Diploma/Degree in Civil Engg. with 2/1 Year's post qualification experience respectively.
11. Desirable Qualification : CITS in Surveyor or D'Man (Civil)

Week-wise Contents Index of First Semester

Sl. No.	Week No.	Topic		Duration (Weeks)
		Trade Theory	Trade Practical	
1	1-3	Tools & equipments, scales, Geometrical Construction	Tools & equipments, scales, Geometrical Construction	3
2	4-5	Classification of Survey, Signs & symbols	Classification of Survey, Signs & symbols	2
3	6-11	Chain Survey	Chain Survey	6
4	12-15	Compass Survey	Compass Survey	4
5	16-21	Plane table Survey	Plane table Survey	6
6	22-26	Project Work/Industrial Visit/Revision/Examination		5
Total				26

Syllabus for the Trade of Surveyor under CTS

First Semester (Semester Code : SUR-01)

Duration : Six Months

Syllabus for TT & TP

Week No.	Trade Theory	Trade Practical
1	Importance of safety, general safety precautions-Introduction to Trade. Uses of different instruments & equipments used by Surveyor, their types and uses. Lettering using stencils.	Familiarization with Institute, importance of Trade training, instruments & equipments used, nature of job done by Surveyors. Drawing different types of lines, printing letters & figures.
2	Scales-different types, principles.	Construction of plane scales.
3	Geometrical construction-lines, angles, triangles, quadrilaterals and circles.	Geometrical drawing-problems on lines, angles triangles & quadrilaterals.
4-5	Classification of survey. Accuracy and speed in field & office work. Common terms used and definitions. Conventional signs and symbols. Use of legends.	Conventional signs & symbols used in survey. Topography and building drawing. Map reading practice, contours, drainage.
6	Linear measuring instruments, their description & uses. Types of chain.	Chain survey-Practice in unfolding & folding chain, errors & adjustments of chains, alignment, chaining lines, measurement of distances and booking.
7	Principles of chain survey. Instruments used & their description.	Practice in chaining, taking offset, use of optical square and cross staff. Setting out right angles and booking. Testing of chain, tape, optical square & cross staff.
8	Field book-types, methods of entry of check lines-its importance.	Procedure in conducting chain survey. Chain survey of small plots by triangulation, booking & plotting.
9	Types of offset and their limit, town survey traversing with chain, procedure in plotting.	Chain survey of built up plots, locating details, booking & plotting.
10	Care & maintenance of chain & accessories. Types of obstacles in chaining and methods of overcoming them.	Taking horizontal measurements on sloping ground, overcoming obstacles, measuring distance between two points invisible from each other.
11	Errors in chain survey & their remedies, problems in chain survey, degree of accuracy required procedure of inking & coloring.	Chain survey of an extensive area, locating details, plotting, finishing in ink & coloring.

12	Use of magnetic needles in survey, types of compass, description, constructional features & uses of compasses, their adjustments- Measurement of directions.	Surveying of a tank, a route or obstructed field by chain traverse, method of finding height of inaccessible objects.
13	Technical terms used in compass survey, difference between angles & bearings, magnetic & true meridians, declination and its variations, local attraction, its detection & elimination.	Practice in setting up a compass & checking its accuracy-taking bearings & calculating angles.
14	Locating details by bearings, compass survey methods, traversing methods, methods of determining true meridians & declination, methods of plotting closed compass traverse-adjustment of closing errors, limits of precision required, field book entries.	Determining the bearings of a given line and establishing lines of given bearings, laying out rectilinear & polygonal plots of ground using compass & tape.
15	Relaying of old service errors in compass survey. Testing & adjustment of compass.	Conducting closed traverse of built up fields and plotting the same.
16-17	Plane table survey-merits & demerits, equipments used, methods of plane tabling.	Setting up of plane table, leveling, centering & orientation. Surveying an area with plane table by radiation & intersection methods.
18-19	Errors in plane tabling & their elimination-other instruments used in combination with plane table, their construction & uses.	Traversing with plane table of built up areas, running an open traverse with plane table & fixing details.
20	Tangent clinometers, Delisle's clinometers & telescopic alidade.	Inking, finishing, coloring & tracing of plane table maps done in previous weeks.
21	Survey maps-care & maintenance of plane table accessories, procedure of plane tabling.	Practice in finding the position of table by three point & two point problems. Use of tangent & Disle's clinometers-Abney level and telescopic alidade for finding heights of surrounding points.
22-26	Project work/Industrial visit (optional)	Revision/Preparatory test & Examination.

Syllabus for the Trade of Surveyor under CTS

First Semester (Semester Code : SUR-01)

Duration : Six Months

Syllabus for Workshop Calculation & Science

Week No.	Workshop Calculation & Science
1	Addition & subtraction of decimal numbers and fractions.
2	Multiplication & division of decimal numbers and fractions. Conversion of decimals into fractions and vice versa.
3-5	Algebra-fundamental formulae, multiplication and factorization.
6-8	Simple equations & simultaneous equations.
9-10	Simple theory of indices.
11-12	Surds
13-15	Quadratic equations & applications.
16	Linear graph, Use of Logarithm tables
17-18	Properties of plane geometrical figures-triangles, rectangles & quadrilaterals.
19	Properties of regular polygons, circles & parallelograms.
20-21	Determination of sides & areas of triangles, quadrilaterals & polygons.
22-26	Revision & Examination.

Week-wise Contents Index of Second Semester

Sl. No.	Week No.	Topic		Duration (Weeks)
		Trade Theory	Trade Practical	
1	1-4	Levelling	Level Survey	4
2	5-6	Contouring	Contouring	2
2	7-11	Theodolite Survey	Theodolite survey	5
3	12	Curves	Curves	1
4	13-14	Road project	Road project	2
5	15	Tacheometry & Triangulation	Tacheometry	1
6	16	Digital Theodolite	Digital Theodolite	1
7	17-18	Total Station, GPS and Photogrammetry	Total Station and GPS	2
8	19-22	CAD , Estimation,Irrigation	Building drawing Using CAD and Estimation	4
6	23-26	Project Work/Industrial Visit/Revision/Examination		4
Total				26

Syllabus for the Trade of Surveyor under CTS

Second Semester (Semester Code : SUR-02)

Duration : Six Months

Syllabus for TT & TP

Week No.	Trade Theory	Trade Practical
1	Leveling-parts, types- Dumpy level & Auto level, types of staff, technical terms used in levelling, permanent adjustment of leveling instruments.	Practice in setting up a level & performing temporary adjustments-practice in reading staff, practice of permanent adjustment of dumpy & auto levels.
2-4	Methods of observation, booking, reduction of levels, types of field book, Working out problems on reduction, various methods of leveling namely simple levelling, differential levelling, reciprocal levelling, fly levelling, check levelling, longitudinal sectioning, cross sectioning etc. Plotting of sections and working profiles, establishment of gradient, effects of Earth's curvature & refraction in levelling, common errors and their elimination, degree of accuracy.	Practicing simple levelling, differential levelling, reciprocal levelling ,fly levelling , longitudinal sectioning, cross sectioning and check leveling. Reduction of levels, preparation of sections and working profiles. Setting out gradients.
5-6	Contouring –contour interval-selection of contour interval-characteristics of contours-uses of contours- contouring by various methods- interpolation of contours by various methods- drawing of contours-computation of volume- Prismoidal formula & trapezoidal formula . Construction and use of boning rods. Establishment of gradient using Ceylon ghat Tracer, Delisle's Clinometer & Abney level.	Locating contour lines- direct and indirect methods- interpolation of contours- contour gradient- preparation of sections from contour map- computation of volume- by prismoidal formula, trapezoidal formula. Establishment of gradient using abney level, Ceylon ghat tracer and by using boning rod and sight rail.
7	Introduction to theodolite, types of theodolites, parts of theodolite, terms used in theodolite surveying, temporary adjustments of theodolite, reading of verniers, booking readings, permanent adjustments of theodolite.	Practice to set up the theodolite and to read the verniers, booking. Performing the permanent adjustments of theodolite.

8	Measurement of horizontal angle by repetition method, reiteration method setting out angles by repetition method, measurement of vertical angle, measurement of deflection angle, measurements of bearings, prolongation of lines and locating the intersection points of directions.	Measurement of horizontal angle by various methods, setting out angles, measurement of vertical angle, deflection angle and prolongation of lines by various methods.
9-11	Traversing using theodolite (closed and open), traverse computation determination of consecutive co-ordinates, independent co-ordinates, checks for traverse, balancing of traverse, closing error, preparation of Gale`s table , computation of area using co-ordinates, omitted measurements.	Traversing (closed and open) using theodolite and steel tape- measurement of horizontal angles, bearings of lines- computation of co-ordinates from the bearing ,angle and length. Preparation of Gales traverse table, plotting of traverse by co-ordinates, computation of area using co-ordinates. Omitted measurements.
12	Curves- purpose- types of curves- Simple-compound-reverse-transition- elements of simple curve- computation of elements of simple curve- various method for setting out simple curves.	Simple curve-computation of elements of simple curve- set out of simple curves by linear and angular methods.
13-14	Types of surveys for the location of a road- points to be considered during reconnaissance, preliminary and final location survey. Classification of roads and terms used in road engineering. Alignments of roads- relative importance of length of road, height of embankment and depth of cutting- road gradients- foundation, drainage, camber, super elevation, road surfaces such as earth road ,water bound macadam and concrete pavements.	Road project-reconnaissance, preliminary & final location survey including preparation of route map, traversing, levelling, preparation of sections, computation of earth work and other materials for laying the road.
15	Introduction to tacheometry- advantages and disadvantages- constants of tacheometer and its determination- various method of tacheometry- determination of horizontal and vertical distances by various methods. Technical terms in connection with simple triangulation-base line measurements& its correction.	Determination of horizontal and vertical distance by tacheometric method. Enlargement and reduction of plans and maps using pentagraph and proportionate compass.

16	Modern survey instrument-Digital theodolite-study of parts-adjustments-measurement of angles by various methods- traversing using digital theodolite (closed and open).	Setting up of digital theodolite. Measurement of horizontal and vertical angles-traversing using digital theodolite.
17-18	Familiarization of modern survey equipments- study of the parts of Total station- temporary adjustments-measurements of angle and co-ordinates- setting out of angles and lines . Traverse survey of closed and open fields-determination of enclosed areas using total station. Introduction to GPS and its uses-adjustments- determination of co-ordinates. Photogrammetry- terms – terrestrial and aerial photogrammetry.	Temporary adjustments of Total Station. Measurements of angles-measurements of co-ordinates-determination of height. Determination of area Traversing (open and closed) using total station Determination of the co-ordinates of the points using GPS.
19-22	Introduction to computer aided drawing-advantages- working with CAD-setting limits-drawing lines-using grid and snap- saving work- drawing simple shapes- Exit and quit commands. Editing, adding dimension and text. Editing drawing using various MODIFY commands. Developing simple buildings with CAD Preparation of estimates for simple buildings. Glossary terms of building construction, building materials and irrigation.	Working with CAD- use of commands such as DRAW MODIFY etc.Adding dimensions and text, Development of 2D drawings. Preparation of drawings and estimates of simple buildings.
23-26	Project work/Industrial visit(optional)/Revision/preparatory Test & Examination	

Syllabus for the Trade of Surveyor under CTS

Second Semester (Semester Code : SUR-02)

Duration : Six Months

Syllabus for Workshop Calculation & Science

Week No.	Workshop Calculation & Science
1	Determination of areas of circles, sectors and segments.
2	Simpson's Rule.
3	Units of length, area & volume and their conversion.
4	Surface area and volume of cubes and cuboids.
5	Surface area and volume of spheres and cylinders.
6	Surface area and volume of prisms and cones. Prismoidal formula.
7	Units of force and weight. Equation of motion.
8	Magnet and magnetism. Laws of magnetic attraction & repulsion. Magnetic substance-Permanent magnet.
9-10	Revision.
11	Introduction to Trigonometry. Basic ratios such as $\sin \theta$, $\cos \theta$, $\tan \theta$ and their reciprocals.
12	Solution of simple triangles.
13	Use of mathematical tables.
14	Problems on heights & distances.
15	Elementary theory of light.
16-17	Properties of mirrors and lenses. Laws of reflection & refraction. Description & use of optical instruments such as telescope, sextant, etc.
18	Load, elongation, stress and strain, hook's law.
19	Modulus of elasticity, elastic limit and yield point.
20	Ultimate stress and breaking stress. Problems.
21-26	Revision & Examination

List of Tools & Equipments for the trade of Surveyor under CTS

A. Trainee's Kit for 20 Trainees and One Instructor

Sl. No.	Description	Quantity
1	Engineering Instrument Box	21
2	Protractor 15 cm full circular	21
3	Card board/ plastic metric scale set- A to H	21
4	Diagonal scale, electroplated	10
5	Celluloid set square 45° & 60°	21 each
6	T square 1250 mm/ Mini drafter	21
7	Erasing shield small size	21
8	Architect's & builder's template	10
9	Chisel- steel 80 mm blade	10
10	French curve- set of 12	10

B. General Outfit

Sl. No.	Description	Quantity
1	Abney level	1
2	Ammonia printing machine with box	1
3	Box sextant	2
4	Boning rod	1 set
5	Binocular	4
6	Chalk board/White board	1
7	Cupboard (Big)	4
8	Ceylon ghat tracer with stand & target	2
9	Scientific calculator	21
10	Computing scales two hectares	4
11	Computing scales five hectares	4
12	Wooden cross staff- box type	2
13	Wooden cross staff- open type	2
14	Drawing Board 1250mmx900mm with stand	21
15	Engineer's chain	2
16	Engineer's level	6
17	Dumpy level	6
18	Auto level	5
19	Tilting level	1
20	Fire extinguisher	1
21	Gunter's chain	2
22	Hand press for numbering & lettering	2
23	Canvas bag	8
24	Height indicators	8
25	Hold all canvas for instruments	8
26	Hones in case	1
27	Instructor's chair	1
28	Instructor's table	1
29	Tracing board with lamp	2
30	Leveling staff - telescopic type	10

31	Metric chain- 30 m & 20 m	5 each
32	Magnifying glass	2
33	Magnet bar (for magnetizing through compass needles)	2
34	Plastic tubes for keeping drawings	21
35	Pen knife	5
36	Pentagraph	2
37	Prismatic compass	5
38	Planimeter (digital)	2
39	Proportionate compass	21
40	Plane table with stand , accessories & water proofing cover	8
41	Telescopic alidade	8
42	Indian pattern clinometers	8
43	Ranging rod 4 m	40
44	Offset rod	5
45	Optical square	5
46	Railway curves-Set of 50 in a box	4
47	Steel almirah (Big)	4
48	Stool	21
49	Survey plotting scale-8 scales with offset scale in box	21 sets
50	Stencil set	5
51	Substance bar	2
52	Metallic tape 30 m	10
53	Metallic tape 20 m	10
54	Steel tape 30 m	10
55	Steel band 30 m & 20 m	2 each
56	Surveyor's umbrella	6
57	Theodolite transit	5
58	Digital Theodolite	2
59	Rules ebonite plain for drawing lines	21
60	Wooden set square, T square & Compass in a box (for chalk board)	1
61	Computer & software	5 sets
62	Total station –Leica make	2
63	Hand GPS-latest version	2
64	A3 size Printer-colour	1
65	Computer table	5
66	Computer chair	5
67	Printer table	1
68	UPS-5KVA	1

List of Consumables for the Trade of Surveyor under CTS

Sl. No.	Consumables (Quantity as per requirement)
1	Drawing sheet-A1 size
2	Field book as required for the survey work
3	Tracing paper roll
4	Drawing pencil-HB, 2H, H, etc.
5	Eraser
6	Adhesive tape
7	Drawing pen/ Rotring pen
8	Drawing ink
9	Color pencil
10	Ammonia paper roll
11	Ammonia liquid
12	Machine-made drawing paper
13	Xerox paper A3 & A4 size

Trade Testing and Certification

Same as for other Similar Engineering Trades.

Further Learning options

After successful completion of CTS Course in the trade of **Surveyor**, the trainees have the option to continue their further studies by joining the CITS Course in the same trade, which is of two semester's duration.

List of Trade Committee Members