

**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 (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 10<sup>th</sup> Class under 10+2 system.
6. Unit Strength : 20
7. Space Norms : 64 Sqm
8. Power Norms : 3 KW (20000 lumen)
9. Job Role : To conduct survey of any type of land using chain, Compass, cross staff, plane table, level, theodolite and other survey instruments.
10. Instructor's Qualification : NTC/NAC in the surveying trade with 3 years' post Qualification experience  
OR  
Diploma/Degree in Civil Engg. with 2/1 years post qualification experience respectively.
11. Desirable Qualification : CITS

## 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                |
| <b>Total</b> |          |  |  | <b>26</b>        |

# Syllabus for the Trade of Surveyor under CTS

**First Semester (Semester Code : SUR-01)**

**Duration : Six Months**

## **Syllabus for TT & TP**

| <b>Week No.</b> | <b>Trade Theory</b>  | <b>Trade Practical</b>  |
|-----------------|--|---|
| 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.  |

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|-------|---|---|
| 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, Dole sole'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 & Dole sole'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**

| <b>Week No.</b> | <b>Workshop Calculation &amp; Science</b>   |
|-----------------|---|
| 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 & area 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            | 1-9      | Level Survey                                       | Level Survey           | 9                |
| 2            | 10-12    | Road Project                                       | Road Project           | 3                |
| 3            | 13-15    | Theodolite Survey                                  | Theodolite Survey      | 3                |
| 4            | 16-19    | Closed & Open Traverse                             | Closed & Open Traverse | 4                |
| 5            | 20-21    | Practice on Theodolite                             | Practice on Theodolite | 2                |
| 6            | 22-26    | Project Work/Industrial Visit/Revision/Examination |                        | 5                |
| <b>Total</b> |          |  |                        | <b>26</b>        |

# 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-Cooks reversible level & dumpy level, types of diaphragm, types of staff, technical terms used in leveling, permanent adjustment of leveling instruments.  | Practice in setting out a level & performing temporary adjustments-practice in reading staff, demonstration of permanent adjustment. |
| 2-4      | Methods of observation, booking, reduction of levels, types of field book, reciprocal leveling, effects of Earth's curvature & refraction in leveling, common errors and their elimination, degree of accuracy, introduction to contour. | Practice in differential leveling-reciprocal leveling, establishing bench marks, Height of collimation and Rise & Fall methods.      |
| 5        | Working out problems on field book reduction, reciprocal leveling & permanent adjustments.   | Performing permanent adjustment to various types of leveling instruments.  |
| 6        | Purpose of sectioning, consideration of distance between points, precautions.  | Establishing of alignment & grade for roads and drains. Method of entering in field book.  |
| 7-8      | Steps in plotting sections, selection of scales, factors affecting selection of formation level- Prismoidal formula & its application, calculation of earthwork.   | Carrying out route survey, longitudinal & cross-section of a road project-its plotting and calculation of earthwork.                 |
| 9        | Construction and use of boning rods and ghat tracer.   | Practice in use of boning rods and ghat tracer for establishing grade lines for various types of work.                               |



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|-------|---|--|
| 10-12 | Types of surveys for the location of a road, points to be considered during reconnaissance, preliminary & final location surveys. Alignment of roads, relative importance of length of road, height of embankment and depth of cutting, road gradients, sub-grades, road foundations, drainage, camber, curves and super elevation, road surfaces such as earth road, WBM road cement concrete road bituminous road, etc. | Road project-reconnaissance, preliminary & final location survey including preparation of route map to scale, taking profile & section with level, plotting, marking formation levels, calculation of earthwork and other materials for laying road. |
| 13    | Introduction to theodolite, temporary adjustments, procedure in setting up, methods of measurement of horizontal angles, repetition & reiteration systems.  | Practice in setting up a theodolite and taking readings.   |
| 14    | Types of field book used in theodolite survey, adjustment of errors while laying a given angle by repetition, method of setting out straight lines, establishing lines at given angles with given lines.  | Measurement of horizontal angles by repetition & reiteration methods, booking, setting out given angles.   |
| 15    | Instrumental errors, their elimination, permanent adjustment, care & maintenance of theodolite. Method of running a traverse, different methods of measuring angles and bearings.   | Practice in measuring vertical angles, setting out given vertical angles, booking. Demonstration of permanent adjustment of theodolite.  |
| 16-17 | Methods of plotting traverses- Gales traverse system, checking of measurements of closed & open traverse, use of traverse tables, closing errors & its adjustment.  | Setting out a straight line over & across obstacles, prolonging lines, establishing lines at given angles with given lines, setting out given rectilinear lines.   |
| 18    | Omitted measurements and their calculation-Practice in working out problems.  | Running a closed traverse over a given area, booking, calculating the ordinates and plotting the traverse.   |

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|-------|---|--|
| 19    | Technical terms in connection with simple triangulation-base line measurements& its correction-procedure of measuring angles-methods of calculating sides from triangulation, data check, errors & precautions. | Running an open traverse, calculate & plot the same and fix the details with plane table, measuring a base line for triangulation. |
| 20-21 | Practice on theodolite and its adjustment.  |  |
| 22-26 | 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 area of circles, sectors and segments.   |
| 2-3      | Simpson's Rule.   |
| 4        | Units of length, area & volume and their conversion.  |
| 5        | Surface area and volume of cubes and cuboids.   |
| 6        | Surface area and volume of spheres.   |
| 7        | Surface area and volume of cylinders.   |
| 8-9      | Surface area and volume of prisms. Prismoidal formula.  |
| 10       | Surface area and volume of cones.   |
| 11-12    | Revision.   |
| 13       | Introduction to Trigonometry. Basic ratios such as $\sin \theta$ , $\cos \theta$ , $\tan \theta$ and their reciprocals. |
| 14       | Solution of simple triangles.   |
| 15       | Use of trigonometrical tables.  |
| 16-17    | Problems on heights & distances.  |
| 18-19    | More problems on mensuration.   |
| 20-21    | More problems on trigonometry.  |
| 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**

| <b>Sl. No.</b> | <b>Description</b>                           | <b>Quantity</b> |
|----------------|--|-----------------|
| 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              | Drawing board 1250 x 900 mm                  | 21              |
| 7              | T square 1250 mm/ Mini drafter               | 21              |
| 8              | Erasing shield small size                    | 10              |
| 9              | Architect's & builder's template             | 10              |
| 10             | Chisel- steel 80 mm blade                    | 10              |
| 11             | Drawing machine (Horizontal type)            | 21              |
| 12             | French curve- set of 12                      | 10              |
| 13             | Metallic tape 15 m                           | 21              |

**B. General Outfit**

| <b>Sl. No.</b> | <b>Description</b>             | <b>Quantity</b> |
|----------------|--------------------------------|-----------------|
| 1              | Abney level                    | 1               |
| 2              | Ammonia printing box           | 1               |
| 3              | Box sextant                    | 2               |
| 4              | Boning rod                     | 1               |
| 5              | Binocular                      | 4               |
| 6              | Chalk board/White board        | 1               |
| 7              | Cupboard (Big)                 | 1               |
| 8              | Celon ghat tracer              | 21 boxes        |
| 9              | Scientific calculator          | 21              |
| 10             | Computing scales two hectares  | 4               |
| 11             | Computing scales five hectares | 4               |
| 12             | Card board scales-box of 8     | 4               |
| 13             | Wooden cross staff- box type   | 2               |
| 14             | Wooden cross staff- open type  | 2               |
| 15             | Drawing board imperial size    | 2               |
| 16             | Drawing machine table          | 4               |
| 17             | Engineer's chain               | 21              |
| 18             | Engineer's level               | 6               |
| 19             | Dumpy level                    | 6               |
| 20             | Cokes reversible level         | 2               |
| 21             | Tilting level                  | 1               |

|    |  |        |
|----|--|--------|
| 22 | Ferro printing frame 450 x 600 mm                    | 1      |
| 23 | Ferro printing frame 800 x 600 mm                    | 1      |
| 24 | Fire extinguisher                                    | 1      |
| 25 | Gunter's chain                                       | 2      |
| 26 | Hand press for numbering & lettering                 | 5      |
| 27 | Canvass bag  | 1      |
| 28 | Height indicators                                    | 8      |
| 29 | Hold all canvas for instruments                      | 8      |
| 30 | Hones in case  | 8      |
| 31 | Instructor's chair                                   | 1      |
| 32 | Instructor's table                                   | 1      |
| 33 | Tracing board with lamp                              | 2      |
| 34 | Leveling staff                                       | 5      |
| 35 | Metric chain- 30 m & 20 m                            | 6 each |
| 36 | Magnifying glass                                     | 6      |
| 37 | Magnet bar (for magnetizing through compass needles) | 2      |
| 38 | Metal tubes for keeping drawings                     | 2      |
| 39 | Pen knife  | 8      |
| 40 | Pentagraph   | 2      |
| 41 | Prismatic compass                                    | 3      |
| 42 | Planimeter (digital)                                 | 21     |
| 43 | Proportionate compass                                | 21     |
| 44 | Plane table with stand & water proof cover           | 6      |
| 45 | Alidade  | 5      |
| 46 | Trough compass                                       | 5      |
| 47 | Plumbing fork with bob                               | 8      |
| 48 | Telescopic alidade                                   | 8      |
| 49 | Indian pattern clinometers                           | 8      |
| 50 | Ranging rod 4 m                                      | 10     |
| 51 | Offset rod   | 40     |
| 52 | Optical square                                       | 5      |
| 53 | Railway curve  | 4      |
| 54 | Steel almirah (Big)                                  | 2      |
| 55 | Stool  | 21     |
| 56 | Survey plating scale with offset bits                | 1      |
| 57 | Stencil set  | 21     |
| 58 | Substance bar  | 2      |
| 59 | Tapes  | 10     |
| 60 | Metallic tape 30 m                                   | 10     |
| 61 | Metallic tape 60 m                                   | 10     |
| 62 | Steel tape 30 m                                      | 10     |
| 63 | Steel band 30 m & 20 m                               | 3 each |

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|----|---|--------|
| 64 | T Square  | 2      |
| 65 | Surveyor's umbrella                                     | 21     |
| 66 | Theodolite transit                                      | 8      |
| 67 | Micrometer Theodolite transit                           | 5      |
| 68 | Traverse staff  | 1      |
| 69 | Rules ebonite plain for drawing lines                   | 1      |
| 70 | Zinc tray   | 21     |
| 71 | Wooden set square, T square & Compass (for chalk board) | 1 each |
| 72 | Computer & software                                     | 3 sets |
| 73 | Total station (Digital Theodolite)                      | 1      |

**List of Consumables for the Trade of Surveyor under CTS**

| <b>Sl. No.</b> | <b>Consumables</b>          |
|----------------|-----------------------------|
| 1              | Drawing sheet-A1 & A2 size  |
| 2              | Tracing paper roll          |
| 3              | Drawing pencil-HB, 2H, etc. |
| 4              | Eraser                      |
| 5              | Adhesive tape               |
| 6              | Drawing pen/ Rotring pen    |
| 7              | Drawing ink                 |
| 8              | Color pencil                |
| 9              | Ammonia paper roll          |
| 10             | Ammonia liquid              |
| 11             | Machine made drawing paper  |
| 12             | Xerox paper 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**





