SHORT TERM VOCATIONAL CERTIFICATE COURSE

LAND SURVEYING
(6 Months Duration)

Prepared by

T. Sree Devi,
Senior Instructor in C.T
Government Junior College, Malakpet [Old],
HYDERABAD

Course Coordinator
Dr. R. JYOTHSNA RANI
Principal & Lecturer SIVE,
O/o Director of Intermediate Education,
Hyderabad

State Institute of Vocational Education
O/o Director of Intermediate Education, Telangana
Hyderabad

LAND SURVEYING

Name of the course : **LAND SURVEYING**

Sector : **Engineering Sector**

Course Code : **LS**

Entry Qualification : **SSC or Above**

Duration : 6 Months - (40 Hours: English + Course content: 200 Hours)

Terminal competence :

By the end of the course the trainees will be able to work as surveyors and also, they can independently carry out/levelling work, needed at different types of construction sites.

Introduction of the course:

The Land Surveying is a six-month certificate course designed to equip students with fundamental skills in measuring and mapping land. The course covers essential topics such as the use of surveying equipment, data collection techniques, and interpreting survey results for various applications in construction, real estate and urban planning.

Objectives:

By the end of the course, the students should learn

- Basic principles of surveying
- Handling surveying equipment like Chain, Compass, Dumpy Level, Theodolite, Total Station
- Measuring the size and shape of an area of land

Skills:

- Measuring distances, calculating the areas, preparing the maps and reports
- Measurement of horizontal and vertical angles with theodolite
- Mapping the position of boundaries of land/site
- Recording the features like agriculture fields, ponds & lakes
- Recording the levels of land and earth work calculations
- Setting out footings, columns, plan of a building on the ground

SYLLABUS (THEORY)

Sn	Major Topics	No. of Hours	Weightage
1	Introduction to Surveying & Drawing	**35**	**1**
2	Chain Surveying	**35**	**17**
3	Compass Surveying	**30**	**16**
4	Levelling	**35**	**17**
5	Introduction to Theodolite Surveying	**30**	**17**
6	Total Station Survey & DGPS	**35**	**17**
	Total		

I. Introduction to Surveying and Drawing: Concept and purpose of

a) Surveying – Instruments used for linear and angular measurements – Classification of Surveys based on instruments – Engineering Surveys – Fundamental Principles in Surveying

b) Fundamentals of Drawing: Engineering Drawing instruments – Free hand lettering and numbering - Geometrical constructions – Division of line – Construction of tangent lines – Construction of Polygons – Construction of Conic Curve ellipse

II Chain Surveying:

Theory

a) Purpose, functions and principles of Chain Survey - Equipment used in chain survey – Different types of chains, metallic and steel tapes, arrows and pegs, ranging rods - Plumb-bob, cross staff, optical square, line ranger-Terms used in chain surveying

b) Errors and corrections in ordinary chaining due to incorrect length of chain or tape

c) Conventional signs – Field book – Recording field notes

d) Different operations in chain surveying – Direct ranging and indirect ranging – chaining on sloping ground- Principles used in chain triangulation

e) Calculation of areas – different methods – average ordinate method, trapezoidal method and Simpson's rule.

f) (i) Units of areas - Acres, square yards, cents, guntas, ankanams, hectares etc., - Relation among them.

(ii) Study of revenue, village/gram panchayat maps, Adangal / Pahani, Tippan (map) etc

Practical:

i). Draw conventional signs used in surveying

ii). Practice folding and unfolding of a chain.
iii). Practice chaining operation on level ground by measuring distance between two given stations.
iv) Practice of taking off sets – oblique and perpendicular off sets – using tape, optical square and cross staff
v) Chaining a line involving indirect ranging.
vi) Performing chain triangulation around a building covering a small area along with details-Features of the area taking offsets and recording in to field book
vii) Plotting of oblique and perpendicular offsets triangulation around the building
viii)Calculate the area of the field by different methods – Using chain and cross staff.

III Compass Surveying:
Theory:
a) Purpose and Principles of compass surveying - Description and working of Prismatic compass- Terms used in compass surveying
b) Concept of true meridian – magnetic meridian – whole circle bearing, quadrantal bearing - conversion of bearing from one system to the other
c) Local attraction – Detection and correction.
d) Traversing with prismatic compass and chain - Closed traverse and open traverse.
e) Errors in compass surveying – Natural and instrumental – closing error and adjustment by graphical methods.
Practical:
i) Identify the component parts of a prismatic compass.
ii) Setting up of a prismatic compass at a station – Observation of bearings and calculation of included angles.
iii) Demonstration of Surveyors compass.
iv) Perform closed traverse survey – checking for errors – applying corrections.
v) Perform open traverse survey - checking for errors – applying corrections.
vi) Plot the traverse – open and closed from the field data after adjusting for closing error by graphical method

IV. Levelling
Theory:
a) Principles and purpose of levelling – definition of level surface, datum, reduced level, bench mark etc – Terms used in levelling
b) Types of levelling instruments – dumpy level and tilting level – component parts- types of levelling staves.
c) Temporary adjustments of dumpy level and tilting level – taking levels of field points – recording level field book.
d) Simple levelling and differential levelling – Reduction of levels by height of collimation method and rise and fall method

e) Errors in levelling - Natural and instrumental errors – Error due to curvature and refraction - Combined error – Corresponding corrections
f) Classification of levelling – check levelling, reciprocal levelling, profile levelling (L.S. and C.S.)
g) Contouring – Characteristics – Methods of contouring – Block contouring – radial contouring – interpolation of contours – tracing contour gradient – use of contour maps – marking alignment of roads, railway and canal

Practical:
i) Study of Dumpy level, tilting level and levelling staff – temporary adjustment of levels in the field.
ii) Taking levels of various points and booking into level field book.
iii) Finding the levels by differential or fly levelling - Reducing levels by height of collimation and rise and fall methods.
iv) Practice differential levelling involving inverted levels.
v) Reciprocal levelling
vi) Performing and plotting of L.S. and C.S. of a given field.

V. Introduction to Theodolite:
Theory:
a) Theodolite: Study of transit theodolite –Identification and understand of theodolite-Technical terms used in Theodolite
b) Temporary adjustments of transit theodolite
c)measurement of horizontal angles by reiteration and repetition methods.
Practical:
i) Study of component parts of theodolite and to practice temporary adjustments.
ii) Taking horizontal angles of given points by repetition and reiteration methods and recording in the field book

VI. Total station survey and DGPS
Theory:
A) Importance of Total station

a) b) Understanding parts of Total station & adjustments
b) c)Measurement of horizontal angle, vertical angle, horizontal distance
c) d)Measurement of difference in height between two points. Setting out plan of a building on the ground
d) Measurement of area of a closed traverse.
e) Resection
f) Road (Highway) Surveys

B) DGPS [Digital Global Positioning System]

a) Introduction

b) Basic concept of GPS
c) Components of GPS
d) d)Working of GPS
e) Applications of GPS

Practical:
i)Understanding parts of Total station & adjustments
ii)Measurement of horizontal angle, vertical angle, horizontal distance
iii)Measurement of difference in height between two points.
iv)Setting out plan of a building on the ground

SYLLABUS(PRACTICAL)

1. Basic Mathematics - Fundamentals of Drawing
2. Introduction to Surveying
3. Chain Surveying
4. Compass Surveying
5. Leveling
6. Introduction to Theodolite Surveying
7. Total Station
8. a. Land Development and Site Surveys
   b. Survey Camp

SCHEME OF INSTRUCTION/MODULE:

1. **Communicative English: 40 hours**
2. **Course : 200 hours**

Duration of Course	**Theory**		**On the Job Training**		**Total**	
	Hours	**weightage**	**Hours**	**weightage**	**Hours**	**weightage**
1 Module (06 months)	60	30%	140	70%	200	100%

SYLLABUS (THEORY)

LIST OF EQUIPMENT

1. **Total Station**: An electronic/optical instrument used for surveying and building construction that measures distances, angles, and elevations.
2. **Theodolite**: A precision instrument for measuring angles in the horizontal and vertical planes.
3. **Level**: An instrument for establishing or verifying points in the same horizontal plane.
4. **GPS Receiver**: Used for determining precise locations using signals from satellites.
5. **Measuring Tape**: A flexible ruler used to measure size or distance.
6. **Prism and Prism Pole**: Used with total stations to reflect the electronic distance measurement.
7. **Tripod**: A three-legged stand to support surveying instruments.
8. **Surveying Rods/Staff**: Graduated rods for measuring vertical distances.
9. **Plumb Bob**: A pointed weight suspended from a string used to determine vertical alignment.
10. **Field Book**: A notebook for recording survey measurements and observations.
11. **Drafting Tools**: Including compasses, protractors, and rulers for creating survey maps and plans.
12. **Personal Protective Equipment (PPE)**: Such as hard hats, high-visibility vests, and safety boots for fieldwork safety.

Qualifications of Teaching Faculty:

- A bachelor's degree in Land Surveying, Geomatics, Civil Engineering, Professional Land Surveyor (PLS) or equivalent certification/licensure or a related field with an aggregate of 55% of marks
- Prior experience in teaching surveying or related subjects at the college or technical school level is advantageous

Division of Marks:

Theory: 100 Max. Marks

1. Communicative English : 20 marks
2. Short Questions : 6 x5m =30 marks
3. Long Questions : 4x10m = 40 marks
4. Multiple Choice Questions : 10x1=10 marks

Practical: 100 Max. Marks

1. External : 40 marks
2. Record/ Mini Project & Viva : 10 marks
3. Internship / OJT : 50 marks

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REGD. NO. | | **TIME : 3 HRS**

MAX MARKS: 100

LAND SURVEYING
MODEL QUESTION PAPER (THEORY)

SECTION- A

COMMUNICATIVE ENGLISH 20 MARKS

SECTION- B

Note: a) Answer ALL questions.
b) Each question carries **5 Marks**. **6X5M=30 MARKS**

1. Write the purposes of surveying.
2. What is a check line. Write the types of surveying stations?
3. Define meridian and write the types of meridians.
4. What is levelling? What is change point?
5. Write the temporary adjustments of theodolite.
6. What is total station? What is GPS?

SECTION- C

Note: a) Answer any **Four** questions.
b) Each question carries **10 Marks**. **4X10M=40 MARKS**

1. Draw the parabola by tangent method. Assume base as 100mm and axis height as 80mm.
2. Name and explain the equipment used in chain surveying with neat sketches.
3. Draw the neat sketch of prismatic compass and label the parts.
4. Explain how you would measure horizontal angle by repetition method using theodolite.
5. Explain measurement of distance by total station.
6. The following readings were taken with a dumpy level, 0.795, 1.655, 2.980, 3.015, 0.655, 0.625, 0.955, 1.255, 1.635, 0.860, 2.375. The instrument has been shifted after the 4^{th} and 8^{th} readings. The first reading was taken on a bench mark whose RL is 100.000. Enter the readings in the form of a level

book page and reduce the level by height of instrument method. Apply usual check.

SECTION-D 10X1=10 Marks

1. The beginning and end of a chain line is called _____
    a. Checkline
    b. Survey Station
    c. Tie Line
2. _____ is an instrument used for setting perpendicular offsets.
    a. Cross Staff
    b. Plumb bob
    c. Arrow
3. ___ is a line which joins two tie stations.
    a. Base line
    b. Check line
    c. Tie Line
4. _____is a standard direction from which the beginning of the lines is measured.
    a. Bearing
    b. Meridian
    c. Local attraction
5. A traverse in which the sides of a traverse from a closed polygon.
    a. Open traverse
    b. Bearing
    c. Closed traverse
6. This is the first reading after setting the level.
    a. Back sight
    b. Fore sight
    c. Intermediate Sight
7. _____ is the process by which the relative height of points in the earth's surface are determined.
    a. Surveying
    b. Levelling
    c. Change point
8. If the vertical circle of the instrument is on the left of the observer while taking a reading, the position is called _____
    a. Face left

b. Face right
c. Face left observation

9. _____ is a combination of an electronic theodolite and an electronic distance meter.
    a. Levelling
    b. Theodolite
    c. Total station
10. Total station is used to measure_____
    a. Horizontal and vertical angles
    b. Horizontal distances
    c. All the above

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LAND SURVEYING
MODEL QUESTION PAPER (PRACTICAL)

Note: a) Answer ALL questions.
b) Each question carries **10 Marks**. **4X10=40MARKS**

1. Draw the Parabola by tangent method. Assume base as 100mm and axis height as 80mm.
2. Find the bearings of given point with prismatic compass and calculate their included angles.
3. Find the reduced levels of the given points using the levelling instrument. Take the bench mark as 500.000m.
4. Measure the area of a closed traverse using total station.

Record/Mini Project & Viva **10 Marks**

Internship/OJT **50 Marks**