

## TRAINING OBJECTIVES

The pass out of this training programme will be able to perform the following duties:

1. Preparation of topographical map of a locality
2. Establishment of the alignment of road, sewer line & pipe line
3. Lay out of building structures, culvert and bridges..
4. Assist the Chief Surveyor to carry out project survey for communication works and utility services.
5. Computation of earth work from contours/ ground sections.

## CURRICULUM SALIENT POINTS

Entry Level	Matric
Duration of course	1-Year (2-Semesters, 20 weeks/ semester)
Total Training Hours	1600 Hours 800 Hours per Semester
Contact Hours per week	6 Days a Week 40 Hours per Week 7 Hours per day except Friday 5 Hours on Friday
Training methodology	Practical      80% Theory        20%
Medium of Instructions	Urdu / English

## **SKILL PROFICIENCY DETAILS**

On successful completion of this course, the trainee should be able to: -

1. Observe personal and equipment safety at work.
2. Use and maintain minor surveying tools and instrument.
3. Carry out setting and adjustments of surveying instruments.
4. Perform linear and angular measurements with precision using conventional as well as electronic instruments.
5. Prepare topographical map of a locality by using conventional as well as Electronic instruments.
6. Make profile and X- section leveling for road project and plotting the same.
7. Set up contour plans of area.
8. Establish the alignment of road, sewer line & pipe line and staking out
9. Formation and invert levels respectively.
10. Set out highway curves (simple, combine & vertical)
11. Perform the layout of building structures, culvert and bridges by using conventional methods as well as electronic instruments.
12. Create control points at project site and shift the bench mark.
13. Compute the earth work volume from contours, spot levels and ground sections.

## KNOWLEDGE PROFICIENCY DETAILS

1. On successful completion of this course, the trainee should be able to:
  -
2. Elucidate the objectives of survey and role of a surveyor in Engineering projects.
3. Describe the basic principles of surveying and method of surveying.
4. Apply the basic concept of trigonometry, drawing for performing survey and plotting the details.
5. Illustrate the basic components of civil engineering structures
6. Apply the fundamental rules / principles of quantity surveying for rough cost estimation & estimation of earth works.
7. Identify the various method of graphical representation & state their Uses.
8. Express the various temporary and permanent adjustment for leveling instruments.
9. Describe how leveling techniques are applied for setting out gradient in road and drainage.
10. Explain the method of contours interpolation.
11. State the method of calculating earth work from spot level, contours and X –section.
12. Give details of the concepts of polar coordinates and rectangular coordinate as applied to fix position of features.
13. Illustrate the method of setting out, instrument used for setting out and checks applicable to setting out.
14. Explain the methods of calculating data for setting out curves.
15. Express how to set out curves with appropriate field check by using theodolite as well as total station.
16. State the use of Drafting Software (Auto Cad) for processing field data and plotting site information.
17. Describe the use Global positioning system (GPS) for surveying and setting out.

## CURRICULUM DELIVERY STRUCTURE

### 1<sup>ST</sup> SEMESTER

	Course Delivery	Co Curricula Activities / Revision	Mid term test	Total
Week	1-20	21-22	23	23
	20	2	1	

### 2<sup>ND</sup> SEMESTER

	Course Delivery	Co Curricula Activities / Revision	Final Test	Total
Week	1-20	21-22	23	23
	20	2	1	

**SCHEME OF STUDIES**  
**Civil Surveyor**  
**(1 – Year Course)**

**1<sup>st</sup> Semester**

Unit No.	Unit Name	Theory Hours	Practical Hours	Total Hours
1.	Fundamental of Civil Technology-I	40		40
2.	Technical Mathematics	20	60	80
3.	Engineering Drawing	10	120	130
4.	Conventional Surveying	40	300	340
5.	Computer Applications	10	120	130
6.	Functional English	20	20	40
7.	Safety at Work & Ethics	20	20	40
<b>Total</b>		<b>160</b>	<b>640</b>	<b>800</b>

**2<sup>nd</sup> Semester**

Unit No.	Unit Name	Theory Hours	Practical Hours	Total Hours
8.	Fundamental of Civil Technology-II	40	-	40
9.	Advanced Surveying	30	180	210
10.	Construction Survey	20	180	200
11.	Basic Quantity Surveying	20	100	120
12.	AutoCAD	10	80	90
13.	Project		80	80
14.	Work Ethics	20	-	20
15.	Functional English	20	20	40
<b>Total</b>		<b>160</b>	<b>640</b>	<b>800</b>

## Examination Scheme Annual Basis Civil Surveyor

S.No	Paper	Theory		Practical		Remarks
		Hours	Marks	Hours	Marks	
1	Fundamentals of civil technology I & II (Unit 1+8)	80	100			MCQs/Short questions only
2	Communications and computer skills (Unit 5, 6,7,12,14 & 15)	100	100	260	100	Practical conducted by the college on behalf of BTE
3	Drawing & conventional survey (Unit 3 & 4)	50	50	420	150	Practical conducted by BTEs (Practical Paper A (drawing) 50 marks, Paper B conventional surveying 100 marks)
4	Advance & construction Survey (Unit 9 & 10)	50	50	360	150	Practical conducted by BTEs (Practical Paper A Advance surveying, Paper B Construction Survey)
5	Technical Mathematics & Basic quantity survey (Unit No. 2 & 11)	40	50	160	50	Theory Type Practical 50 Marks conducted by BTE
6	Project			80	50	Conducted by concerned college
	<b>Total</b>	<b>320</b>	<b>350</b>	<b>1280</b>	<b>500</b>	

**Note:** 40 Theory contact hours = 1 Credit Hour = 50 Marks  
120 Practical Contact Hours = 1 Credit Hour = 50 Marks

---

## DETAIL OF COURSE CONTENTS

**Surveyor**  
(1 – Year Course)

**(1<sup>st</sup> – Semester)**

Sr. No	Detail of Topics	Theory Hours	Practical Hours
1.	Fundamental of Civil Technology-I		
	1.1. Introduction to civil Technology	1	
	1.1.1. History		
	1.1.2. Branches of Civil Technology		
	1.2. Engineering Materials	10	
	1.2.1. Bricks & Tiles: types, manufacturing and properties.		
	1.2.2. Cement; composition, manufacturing types and uses.		
	1.2.3. coarse & fine aggregates: types, & uses.		
	1.2.4. Concrete; ingredients types, usual ratios method of preparation, compaction and transportation.		
	1.2.5. Timber; types, seasoning and wood products etc.		
	1.2.6. Ferrous metals; types, structural steel sections, and reinforcing steel.		
	1.2.7. Non-ferrous metals; aluminum properties and uses.		
	1.2.8. Paints, distemper, emulsion; uses		
	1.2.8 Asphalt & bitumen		
	1.2.9 Glass; types, & uses		
	1.3. Building Structures	2	
	1.3.1. Classification of buildings		
	1.3.2. Structures		

	1.3.2.1. Masonry structures 1.3.2.2. Timber Structures 1.3.2.3. Frame structures 1.3.2.4. Composite structures.		
	1.4. Components of Buildings 1.4.1. Foundations; Shallow and deep foundation and functions 1.4.2. Damp Proof course; types & materials. 1.4.3. Masonry work; mortar ,bonds 1.4.4. Walls; types & function. 1.4.5. Arches & lintels; types & function. 1.4.6. Door & windows; types and function. 1.4.7. Stair & stair case; types of stairs. 1.4.8. Floors; types and composition. 1.4.9. Roofs; types & composition	10	
	1.5. Water Supply & Drainage 1.5.1. Basic requirements for residential buildings. 1.5.2. Types of water supply pipes, fittings, fixtures and valves 1.5.3. Sewer pipe; types and jointing 1.5.4. Sanitary Fitting & Fixtures 1.5.5. Septic tank, sockage pit. 1.5.6. Laying of sewer.	3	
	1.6. Highways Engineering 1.6.1. History & Classification of roads 1.6.2. Highway Engineering terms. 1.6.3. Road structure; sub grade, sub base, Base & surfacing etc. 1.6.4. Road pavement; types & method of construction.  1.6.5. Highway Geometry; camber, gradient, curves and super elevation etc.	10	



	<p>1.6.6. Intersection; fly over, road marking, and road signs etc.</p> <p>1.6.7. Highway drainage; surface drainage (side drain) and cross drainage works.</p> <p>1.6.8. Introduction of road making machinery.</p> <p>1.6.9. Airports; components &amp; layouts</p> <p>1.7. Highway project surveys &amp; alignment</p> <p>1.7.1. Highway alignment; controlling factors</p> <p>1.7.2. Highway surveys;</p> <p>1.7.2.1. Map study &amp; Reconnaissance survey</p> <p>1.7.2.2. Preliminary location survey; Route Survey, L-sectioning &amp; cross Sectioning</p> <p>1.7.2.3. Final location survey (detailed Survey) establishment of center line, Detailed profile leveling, X-Sectioning, etc.</p> <p>1.7.3. Highway project drawings.</p> <p>1.7.4. Project report.</p>	4	
	Sub total	40	
2.	<p>Technical Mathematics</p> <p>2.1. Basic Arithmetic</p> <p>2.1.1. Addition and Subtraction</p> <p>2.1.2. Multiplication and Division</p> <p>2.1.3. Fractions, addition, multiplication &amp; division of fractions</p> <p>2.1.4. Percentage, proportion</p>	2	

	2.1.5. Logarithms		
	2.1.6. Exercise		4
	2.2. Units, Significant Figures	1	
	2.2.1. Units of Measurements		
	2.2.2. International System of units		
	2.2.3. Ft-lb System		
	2.2.4. Conversion of Units		
	2.2.5. Significant Figures		
	2.2.6. Rounding off Number		
	2.2.7. Use of Scientific Calculator		
	2.2.8. Exercise		4
	2.3. Introduction to Algebra	4	
	2.3.1. Variables, constants, coefficient, exponent etc.		
	2.3.2. Basic Algebraic Operations		
	2.3.3. Factorization		
	2.3.4. Simple Linear Equations		
	2.3.5. Quadratic Equations		
	2.3.6. Exponents		
	2.3.7. Exercise		18
	2.4. Practical Geometry	6	
	2.4.1. Points, lines, surfaces, angles, perpendicular & parallel lines.		
	2.4.2. Triangles, quadrilaterals, polygons.		
	2.4.3. Circle, arc, sector & segment		
	2.4.4. Apply formulas for area and perimeters of plane geometrical figures.		3
	2.4.5. Areas of Irregular shapes ; Simpson's rule, middle ordinate rule and trapezoidal rules.		3
	2.4.6. Practice to calculate the area of different regular & irregular shaped plots / pieces of land.		3
	2.4.7. Volume & surface area of solid		

	geometrical shape.		
	2.4.8. Practice to calculate the volume and surface areas of geometrical shapes.		3
	2.4.9. Practice to calculate covered area of building from working drawings.		4
	2.5. Practical Trigonometry	6	
	2.5.1. Angles and Their Measurement; Degrees and Radians		
	2.5.2. Trigonometric ratios.		
	2.5.3. Trigonometric Functions.		
	2.5.4. Solve Right Angle Triangles		
	2.5.5. Pythagoras' Theorem		
	2.5.6. Apply the Laws of Sines , Cosines and Tangents in Solving Oblique Triangles		
	2.5.7. Introduction of co-ordinate geometry; Rectangular coordinates polar coordinates		
	2.5.8. Exercise		
			18
	Sub total	20	60

3.	<p>Engineering Drawing</p> <p>3.1. Introduction</p> <p>3.1.1. Importance of Engineering Drawing</p> <p>3.1.2. Types of Drawing</p> <p>3.1.3. Drawing Tools &amp; Instruments</p> <p>3.1.4. Drawing Sheet</p> <p>3.2. Lettering &amp; Lines</p> <p>3.2.1. Types of lettering</p> <p>3.2.2. Single stroke lettering styles</p> <p>3.2.3. Vertical and Inclined Styles</p> <p>3.2.4. Types of Lines: Identification &amp; construction</p> <p>3.2.5. Selection of Pencil</p> <p>3.2.6. Title Strip &amp; Title blocks; types &amp; sizes</p> <p>3.2.7. Practice in free hand single stroke lettering</p> <p>3.2.8. Practice in freehand single stroke Italic lettering</p> <p>3.2.9. Practice to draw different types of lines</p> <p>3.2.10. Perform distribution of drawing sheet and drawing title strip and title blocks</p> <p>3.3. Geometrical Drawing</p> <p>3.3.1. Angle and Types of Angle</p> <p>3.3.2. Plane Geometrical Figures</p> <p>3.3.2.1. Triangles: Types &amp; Construction</p> <p>3.3.2.2. Quadrilateral: Types &amp; Construction</p> <p>3.3.2.3. Polygons: Types &amp; Construction</p> <p>3.3.3. Circle; sector &amp; segment</p> <p>3.3.4. Geometrical solids, types</p> <p>3.3.5. Ellipse: Method of constructions</p> <p>3.3.6. Practice to draw inscribed and circumscribed triangles</p>	<p>1</p> <p>1</p> <p>1</p>	<p>3</p> <p>3</p> <p>3</p> <p>3</p>
----	--	----------------------------	-------------------------------------

	3.3.7. Draw regular, polygon (hexagon, pentagon and octagon)		
	3.3.8. Construct conic section (ellipse & parabola) by using different methods		2
	3.4. Scale		4
	3.4.1. Types and uses		
	3.4.2. Representative fraction		6
	3.4.3. Graphical Representation of scale		
	3.4.4. Selection of scale		
	3.4.5. Practice to construct different scales used in civil engineering	1/2	
	3.5. Sketching		
	3.5.1. Techniques in sketching lines		
	3.5.2. Principles of freehand sketching		
	3.5.3. Sketching to the scale		3
	3.5.4. Methods of sketching, circle, ellipse, and different geometrical shapes	1/2	
	3.5.5. Practice in freehand lining of different pattern of lines		
	3.5.6. Practice in freehand proportionate sketching of different, triangles, polygon, circle, ellipse and different objects		2
	3.6. Orthographical Projections		
	3.6.1. Projections: Parallel Projections and Central Projections		4
	3.6.2. Orthographic Projections		
	3.6.2.1. Principal Planes of Projection		
	3.6.2.2. Dihedral Angle	2	
	3.6.2.3. Trihedral Angle		
	3.6.3. 1 <sup>st</sup> Angle Projection System		
	3.6.4. 3 <sup>rd</sup> Angle Projection System		
	3.6.5. Rules to draw orthographical projections		

	<p>3.6.6. Practice to complete the missing lines in orthographic views</p> <p>3.6.7. Practice to draw the missing view when two views are given</p> <p>3.6.8. Practice to draw orthographic views of different wooden blocks, v-block, u-block and objects etc.</p>		3
	<p>3.7. Sectioning</p> <p>3.7.1. Purpose of sectional view</p> <p>3.7.2. Location of cutting plane line; arrow head</p> <p>3.7.3. Types of sectional views: Full Section and Half Section</p> <p>3.7.4. Draw full sectional front view, side view and top view of a wooden block</p> <p>3.7.5. Draw half sectional front view, side view and top view of a wooden block</p>	1	3
	<p>3.8. Dimensioning</p> <p>3.8.1. Types of dimensions: dimensions lines, symbols and notes</p> <p>3.8.2. Methods of dimensioning: Location Dimensioning system Base-line dimensioning system</p> <p>3.8.3. Rules and procedures for dimensioning.</p> <p>3.8.4. Practice to mark / label dimension on different pre-draw orthographic views &amp; objects.</p>	1	12
	<p>3.9. Pictorial Drawing</p> <p>3.9.1. Definition, Uses &amp; types</p> <p>3.9.2. Isometric Axis, Angle &amp; Scale</p> <p>3.9.3. Method of Construction of Isometric</p> <p>3.9.4. Oblique Projections: Types &amp;</p>		6

	Construction	1	
	3.9.5. Perspective Projections: Varnish point, parallel & angular perspective.		
	3.9.6. Practice to draw isometric view from given orthographic views of different objects		
	3.9.7. Practice to draw oblique view of different objects		
	3.9.8. Practice to draw one point and two point perspective view of wooden blocks		6
	3.10. Building Drawing		6
	3.10.1. Common building terms		
	3.10.2. Building Symbols; materials, and components (including sanitary and electrical installation symbols)		3
	3.10.3. Types of building drawings, submission drawings, working drawings, As-built drawings etc.	1	
	3.10.4. Practice to draw symbols used in architectural drawing, sanitary and electrification drawings		
	3.10.5. Draw x-section of wall showing foundation, plinth, floor, Door, lintal, sunshade and roof details		3
	3.10.6. Draw plan, elevation and section of single room with verandla.		
	3.10.7. Draw detailed plan, elevation and section of single story one bed room residence.		3
	3.10.8. Prepare foundation layout plan of a single story residence		6
	3.10.9. Draw layout plan for a simple framed structure commercial building.		9

			6
			9
<b>Sub total</b>		10	120
4.	Conventional Surveying 4.1. Fundamental of Surveying 4.1.1. Purpose of Surveying 4.1.2. Role of Surveyor 4.1.3. Basic Principles of Surveying 4.1.4. Classification of Surveying 4.1.5. Survey Scales 4.1.6. Minor Surveying tools & their uses	3	
	4.2. Tape & offset survey 4.2.1. Introduction, Principles and Limitations of tape Survey 4.2.2. Instruments and tools, handling, testing and adjustments 4.2.3. Ranging Survey line and distance measurement on horizontal and sloped ground 4.2.4. Errors in linear measurements and corrections.	4	



	4.2.5. Problem solving regarding error in linear measurements.		3
	4.2.6. Procedure of tape survey; Reconnaissance, index, sketch, triangulation, selection of stations, base line, reference sketch & field book.		
	4.2.7. Method of Taking offsets, field book and booking procedure.		
	4.2.8. Practice to range survey line, intervisible and obstructed stations.		3
	4.2.9. Perform testing and adjustment of chain		
	4.2.10. Practice to measure the distance between two points (horizontal ground, sloppy ground)		3
	4.2.11. Practice to take offsets across the tape line & recording in field book.		3
	4.2.12. Perform Chain Survey of an area		3
	4.2.13. Plot Chain Survey Work on drawing sheet		12
4.3.	Compass Survey		
	4.3.1. Introduction; justification of compass survey, compass; types and working.		6
	4.3.2. Bearing systems; Azimuth, W.C.B, Reduced bearing	4	
	4.3.3. Meridians, types, local attraction and its correction, magnetic declination, dip of needle.		
	4.3.4. Traversing, closed and open traverse		
	4.3.5. Computation of included angle from bearings		
	4.3.6. Practice to set and taking bearings of objects with prismatic and surveyor compass		

	4.3.7. Perform compass survey of an area (closed and open traverse).		3
	4.3.8. Check & correction of observed bearing of closed traverse and calculate the included angles.		9
	4.3.9. Plotting compass traverse by included angle method and adjustment of closing error by graphical method .		3
			9
	4.4. Plane Table Survey		
	4.4.1. Introduction; term used, equipment used in plane tabling ,		
	4.4.2. Orientation		
	4.4.3. Method of plane table; radiation, intersection, traversing & resection method,	3	
	4.4.4. Practice to setup plane table on a station and plot the surrounding features by radiation method		
	4.4.5. Prepare a plan of an area by intersection method and traversing method.		6
	4.4.6. Two & three points problems		
	4.4.7. Determination of position of ground station on already plotted plane table sheet by mechanical and Bissell's method		12
	4.5. Leveling		6
	4.5.1. Introduction and terms used in leveling		
	4.5.2. Types of levels, parts and temporary adjustment of level.		
	4.5.3. Types of leveling staves	6	
	4.5.4. Types of leveling, simple leveling differential leveling, precise leveling,		

	laser leveling, profile leveling, reciprocal leveling and check leveling.		
	4.5.5. Computations of reduced level (H.I system and rise fall system)		
	4.5.6. Errors in book keeping & checking techniques		
	4.5.7. Principle of equalizing back sight & fore sight distances		
	4.5.8. Curvature & refraction corrections		
	4.5.9. Permanent adjustment of level instrument		
	4.5.10. Practice to perform temporary adjustment of auto set and tilting level		
	4.5.11. Practice to take staff reading through instrument (Feet system and metric system)		
	4.5.12. Practice to determine the difference in elevation between two points (sighted from single position of instrument).	3	
	4.5.13. Practice to determine the difference in elevation between two distant point, by collimation method and rise and fall method	3	
	4.5.14. Practice to determine the reduced level of different compartment of building such as road level, plinth level, window sill level beam bottom and roof level etc.	9	
	4.5.15. Carry out profile leveling (L- Sectioning) on strip of land having $\frac{3}{4}$ km length	3	
	4.5.16. Plotting the profile leveling work on graph paper & mark Formation Level		
	4.5.17. Perform cross section leveling on a		

	proposed centre line of a route		12
	4.5.18. Plotting the cross section of already performed work		
	4.5.19. Perform fly leveling between two points, starting from BM and perform check leveling also.		3
	4.5.20. Perform shifting of benchmark by precise leveling		15
	4.5.21. Setting out longitudinal gradient (staking at 30ft interval)		6
	4.5.22. Perform permanent adjustment of dumpy level; Adjustment of bubble, Adjustment of line collimation		6
4.6.	Tachometry		9
	4.6.1 Technical terms, methods		
	4.6.2 Stadia method, tachometry constant fixed stadia hair method, moveable stadia hair method		6
	4.6.3 Errors and precisions in tachometry		6
	4.6.4 Practice to measure distance Between Points on ground under various Conditions	3	
4.7	Contouring		
	4.7.1 Definition, terms used & objectives of Contouring		
	4.7.2 Characteristics of contour lines		
	4.7.3 Direct & indirect method of locating Contour.		6
	4.7.4 Interpolation of contours; arithmetic method, graphical method		
	4.7.5 Uses of contour map; contour gradient	5	
	4.7.6 Carryout spot leveling of grids of an		

	area and prepare contour plan.		
4.7.7	Perform contour survey by tachometry (radial line method)		
4.7.8	Plotting / interpolation of contours by Arithmetic method & graphical method (Taking data of already performed Field work)		15
4.8	Theodolite Surveying		
4.8.1	Vernier and its principles, computation of least count.		12
4.8.2	Introduction of theodolite, parts, types		9
4.8.3	Temporary adjustment including Centering and leveling and removal of Parallax		
4.8.4	Angular measurement, vertical angle horizontal angles (repetition method reiteration method) deflection angle, measurement of magnetic bearing.	12	
4.8.5	Practice to perform temporary adjustment of theodolite on a station.		
4.8.6	Practice to measure a horizontal angle between two station points by vernier and microptic theodolite.		
4.8.7	Practice to prolong a survey line and lining in.		
4.8.8	Practice to measure the horizontal angle by repetition method		3
4.8.9	Practice to measure the horizontal angles by reiteration method		6
4.8.10	Practice to measure the magnetic bearing of line		
4.8.11	Practice to measure the vertical angle		3
4.8.12	Practice to measure the height of		

	building or tower with theodolite. (trigonometric leveling)		6
			6
4.8.13	Theodolite traversing; traverse and its different types		3
4.8.14	Steps involved in traversing.		3
4.8.15	Standard of accuracy of linear and angular measurements		6
4.8.16	Exercise to Compute the bearing from angles & computation of coordinates		
4.8.17	Closing errors & its adjustment		
4.8.18	Exercise to Balance the traverse		
4.8.19	Exercise to compute the area of traverse		
4.8.20	Perform theodolite traversing of an area.		12
4.8.21	Prepare Gale's traverse table taking data of already done field, compute the coordinates and adjust closing error		9
4.8.22	Plot the closed traverse with help of Gale's table.		3
4.8.23	Picking up details by plane tabling.		15
			6
			3
			9
	Sub total	40	300

5.	Computer Applications		
5.1.	Introduction to Computer	2	
5.1.1.	Brief history of computer		
5.1.2.	Classification of personal computers		
5.1.3.	Characteristics of personal computers		
5.1.4.	Input Output devices		
5.1.5.	Storage devices		
5.1.6.	Hardware & software		
5.2.	Introduction to Windows	2	
5.2.1.	Windows interface: desktop, taskbar, Icons, system tray, start button etc.		
5.2.2.	Windows uses; Title bar, control bar, status bar, scroll bar, Menu bar and dialog box , screen saver and clip board.		
5.2.3.	Windows Help		
5.2.4.	Files & Folder Creation		
5.3.	Windows Skills		
5.3.1.	Practice to boot computer, Opening start menu, closing program and shutting down and restarting the computer		2
5.3.2.	Practice to set start menu, taskbar, time and date		1
5.3.3.	Practice to create a new folder at desktop and copying / moving a file onto the folder		2
5.3.4.	Practice to organize icons in order and deleting icon, files and folders at desktop		2
5.3.5.	Practice to rename / change the name of file and folder		2
5.3.6.	Practice to search files and folders		
5.3.7.	Practice to use the recycle bin and		2

	windows explorer		2
	5.3.8. Practice to run a program in windows using Run & My Computer		2
	5.3.9. Practice to hide files and folders and to display hidden files and folder		2
	5.3.10. Practice to use a flash drive and CD for copying data		2
	5.3.11. Demonstration to install Windows / software		3
	5.3.12. Practice to install printer and making a printer default one		2
5.4.	Word Processing	2	
	5.4.1. Introduction to MS Word		
	5.4.2. Loading and unloading MS word program		
	5.4.3. Opening, closing and saving documents		
	5.4.4. Editing, Navigating, Viewing and printing documents		
	5.4.5. Formatting documents and inserting objects		
	5.4.6. Page Setup, Print Setup		
	5.4.7. Enhancement, tools & tables		
5.5.	word Skill		
	5.5.1. Practice of opening, saving renaming and closing documents		2
	5.5.2. Practice to select text, delete, undo, redo and searching text in a document		3
	5.5.3. Practice to copy , cut and paste text in a document		
	5.5.4. Practice in formatting paragraph and text (Font setting, alignment indent etc.)		3
	5.5.5. Practice of checking spells and		9



	correcting grammar of a text		
	5.5.6. Type and formatting reports / letters and mail merging & email merging		3
	5.5.7. Practice in formatting page setup and print setup		18
			3
	5.6. Spreadsheet (Excel)		
	5.6.1. Introduction to MS Excel		
	5.6.2. Opening & Closing Spreadsheet	4	
	5.6.3. Data types, worksheet and workbook		
	5.6.4. Data formatting and inserting objects		
	5.6.5. Formatting cells		
	5.6.6. Excel Operations		
	5.6.7. Function and function wizards		
	5.6.8. Printing worksheet		
	5.7. Excel Skill		
	5.7.1. Practice of opening & closing spreadsheet		
	5.7.2. Practice of data formatting, inserting objects		1
	5.7.3. Practice of setting fonts, setting and printing worksheet		3
	5.7.4. Practice of formatting cells (setting width, height, etc)		3
	5.7.5. Practice in preparing worksheets based on leveling field data and apply formula for computation of results		3
	5.7.6. Practice in function and function wizard		12
	5.7.7. Prepare worksheets regarding survey data x-section (L-Section) and apply formula for computation earth work (Different exercise)		3
			30

<b>Sub total</b>		10	120
6.	Functional English	20	20
7.	Safety at work & Ethics 7.1. Importance of safety at work 7.2. Hazards at work: Fall hazards, tool hazards, fire, heat stress, electrical hazards, noise, confined space, biological hazards 7.3. Personal Protective equipment; Types, uses & selection 7.4. Slip, trip and falls sources and safety measures 7.5. Tool safety 7.6. Electrical hazards: sources and method of protection 7.7. Fire: basic principle and types of fire 7.8. Firefighting equipment: uses 7.9. Emergency response procedure: alarm evacuation, means of escape and assembly point 7.10. First aid procedures 7.11. Attitude development 7.12. Practice to use PPE as per requirements of task 7.13. Carry out basic fire fighting techniques in simulates conditions (wood, Paper, Oil & electrical fire) 7.14. Carry out basic first aid treatment in simulated conditions for electric shock 7.15. Carry out basic first aid treatment in simulated conditions (Bleeding, Fracture etc) 7.16. Participate in emergency procedures	20	
<b>TOTAL</b>		<b>160</b>	<b>640</b>

## DETAIL OF COURSE CONTENTS

### Surveyor

(1 – Year Course)

(2<sup>nd</sup> – Semester)

Sr. No	Detail of Topics	Theory Hours	Practical Hours
1	(Unit 8) Fundamental of Civil Technology-II 1.1 Water supply & system 1.1.1 Impurities in water 1.1.2 Introduction to water purification; water treatment plants. 1.1.3 Water distribution system (brief introduction) 1.1.4 Pipes and accessories 1.1.5 Tube well & pumps (types & uses) 1.1.6 Survey and Layout of a water supply scheme	6	
	1.2 Sewerage Systems 1.2.1 Types & components of sewerage system 1.2.2 Sewer & sewer appurtenances 1.2.3 Introduction to sewage treatment and disposal 1.2.4 Project survey & layout of a sewerage scheme for a locality	6	
	1.3 Bridges & Culverts 1.3.1 Components of Bridge & Culvert 1.3.2 Types of Bridges & Culverts	2	

	<b>1.4 Irrigation &amp; Works</b> 1.4.1 Irrigation system in Pakistan 1.4.2 Hydrological cycle 1.4.3 Introduction to Dam; functions & types 1.4.4 Introduction to distribution Works, Barrages & Headworks 1.4.5 Discharge, measurement of velocity of flow; River gauging 1.4.6 Catchment area, run off 1.4.7 Project survey of an irrigation scheme	10	
	<b>1.5 Railway</b> 1.5.1 Railway Track & its components 1.5.2 Points, crossing & signal 1.5.3 Maintenance of permanent way	6	
	<b>1.7 Electricity</b> 1.7.1 Introductions to Electrical Energy, relation between; Voltage, Ampere, Watt & Resistance 1.7.2 Circuits; series & parallel 1.7.3 Conductor, insulation 1.7.4 Cables 1.7.5 Wiring types, components of electrical wiring 1.7.6 Fuse, circuit breakers, earthing 1.7.7 Electric shock; safety against electric shock	10	
<b>Sub total</b>		40	
2.	(unit 9) Advance Surveying 2.1 Introduction to Total Station 2.1.1 Characteristics of Total Station Instrument 2.1.2 Types of Total Stations	2	

	2.1.3 Functions Performed	2	
	2.1.4 Parts of Total Station & Prism		
	2.1.5 Working Principle		
	2.1.6 Care & Calibration		
	2.2 Getting Started	3	
	2.2.1 Setting up of instrument includes Centering & leveling		
	2.2.2 Setting of Atmospheric Correction, Prism Constant, corrections for Refraction and Curvature		
	2.2.3 Modes of measurements, units of measurements.		
	2.2.4 Practice to set total station on a point & prepare for measurement (atmosphere correction prism correction and selection of units)	3	
	2.3 Operations with Total Station		
	2.3.1 Distance Measurement Mode: horizontal Distance, Vertical Distance and Slope Distance Measurements		
	2.3.2 Angle Measurement Mode; horizontal angle & Vertical Angle Measurement		
	2.3.3 Co-ordinate Measurement Mode		
	2.3.4 Special Mode; REM (Remote Elevation Measurement, MLM (Missing Line Measurement)		
	2.3.5 Practice to measure the horizontal and slope distances by total station		
	2.3.6 Practice to enter the coordinate of occupied point, height of instrument & height of prism.		
	2.3.7 Practice to measure the coordinate of		

	different points by using coordinate mode		
	2.3.8 Practice to measure horizontal angle by repetition method with total station.		3
	2.3.9 Practice to measure the vertical angle & percentage.		6
	2.3.10 Practice to stack out different point at various distances on a line.		
	2.3.11 Practice to measure the height of an object with total station by using REM program with and without prism height input		3
	2.3.12 Practice to measure the distance between different station points with the help of occupied point (MLM) by using measure data or by using coordinate data		3
	2.3.13 Practice to measure the area of a traverse by direct field observations.		6
	2.3.14 Practice to calculate the area from coordinate data file etc.		
	2.3.15 Practice to measure the coordinates of survey points by point to line measurement program	4	
	2.3.16 Practice to set the Z coordinates of occupied point;		
	i) entering the instrument height,		
	ii) known point coordinates, data file		
	iii) inputting the R.L. of any known visible point		
	2.4 Total Station Survey		
	2.4.1 Occupied Point and Back site point Setup		6
	2.4.2 Initial data entry.		
	2.4.3 Taking Observations		6
	2.4.4 CODE Library, Adding, Editing and Deleting data		
	2.4.5 Strings Setting and other Commands for		3

	<p>Data Recording</p> <p>2.4.6 Practice to perform data collection; selection of file, setting occupied point, setting back site point and survey point data entry etc.</p> <p>2.4.7 Practice to find the coordinate of instrument station (New point) by resection method, through distance measurement or angle measurement</p> <p>2.4.8 Practice to find the coordinate of new point by side shot method.</p> <p>2.4.9 Perform topographical survey of an locality</p> <p>2.5 COGO</p> <p>2.5.1 Area Calculation from file data</p> <p>2.5.2 Line length measurement</p> <p>2.5.3 Co-ordinate Calculation</p> <p>2.5.4 Angle Calculation</p> <p>2.5.5 Curve Data Calculation</p> <p>2.5.6 Convert the pre-calculated data for setting out simple circular curve into coordinate data and prepare coordinate data file for the purpose.</p> <p>2.5.7 Prepare coordinate file for lay out of a building using the layout plan</p> <p>2.6 Data &amp; Memory Management</p> <p>2.6.1 Storing &amp; Retrieving the Survey data</p> <p>2.6.2 Data Transfer from Total Station to Personal Computers</p> <p>2.6.3 Converting the Data File into Excel &amp; AutoCAD</p> <p>2.6.4 Plotting the Data</p> <p>2.6.5 Practice of file maintenance; searching recorded data and coordinate data, rename a file, delete a file, editing P-code library,</p>	<p>3</p> <p>3</p> <p>6</p>	<p>12</p> <p>9</p> <p>9</p> <p>9</p> <p>12</p>
--	--	----------------------------	--

	conversion of measured data file into coordinate data file and data transfer to pc & vice verse		6
	2.6.6 Transfer data of topographical survey in AutoCAD software and preparing the plan		3
	2.7 Triangulation with Total Station		
	2.7.1 Introduction to triangulation		9
	2.7.2 Classification of triangulation Survey		
	2.7.2.1 First Order		9
	2.7.2.2 Second Order		
	2.7.2.3 Third Order		15
	2.7.3 Factors involved in selection of station & baseline		
	2.7.4 Steps in triangulation survey		
	2.7.5 Corrections in triangulation & baseline		12
	2.7.6 Astronomical observation for true meridian.		
	2.7.7 Solve numerical problem regarding correction in base line measurement	2	
	2.7.8 Perform astronomical observation to determine true meridian.		
	2.7.9 Solve numerical problem regarding adjustment of angular measurement of triangulation.		6
	2.7.10 Perform baseline measurement and perform correction for triangulation	5	12
	2.7.11 Perform triangulation survey with theodolite & tape; adjust the errors in linear & angular measurements compute latitude and departure of triangulation stations & plotting the frame work.		
	2.7.12 Establish the triangulation frame work with total station and preserve the triangulation station etc.		



	<p>2.8 Laser surveying techniques</p> <p>2.8.1 Laser Leveling</p> <p>2.8.2 Grade; using laser levels</p> <p>2.8.3 Machine guidance &amp; Control</p> <p>2.8.4 Setting out alignment and staking out invert level of sewer line by using laser.</p> <p>2.8.5 Perform leveling practice with laser level</p> <p>2.9. Introduction of Advance surveying Techniques</p> <p>2.9.1 Introduction of eagle point / Civil CAD or similar software</p> <p>2.9.2 File creation, DTM &amp; Tin generation</p> <p>2.9.3 Introduction of GPS Surveying</p> <p>2.9.4 Introduction of GIS (Geographic Information System)</p> <p>2.9.5 Bathymetric Survey</p> <p>2.9.5.1 Introduction</p> <p>2.9.5.2 Conventional Techniques, Sounding</p> <p>2.9.5.3 Digital Techniques (Echo Sounder)</p>		
<b>Sub total</b>		30	180
3	<p>(Unit 9) Construction Survey</p> <p>3.1 Introduction</p> <p>3.1.1 Importance of Construction Survey</p> <p>3.1.2 Construction Projects</p> <p>3.2 Setting out Structures</p> <p>3.2.2 Horizontal Control; instrument used</p> <p>3.2.3 Vertical control; method and instruments</p> <p>3.2.3 Check applicable to setting out</p> <p>3.2.4 Perform layout of simple two room building by simple method, check diagonal and set-up profile.</p>	<p>2</p> <p>4</p> <p>3</p> <p>3</p>	

	3.2.5 Establish the datum at work site e.g. floor level and temporary bench mark		9
	3.2.6 Perform layout of simple 10 marlas residential building by conventional method		15
	3.2.7 Setting out light frame structure building using Total Station (after inputting coordinate abstracted from given drawing.)		6
	3.2.8 Establish verticality of structure using an optical plumbbit, theodolite and an alignment laser		9
	3.2.9 Perform layout of a simple culvert by conventional method.	2	15
	3.2.10 Perform layout of a bridge by Total Station including creating coordinate data file.		
	3.3 Setting Out Pipe lines		
	3.3.1 Conventional method using sight rail, boning rods.		6
	3.3.2 Laser beam method		9
	3.3.3 Setting out the alignment		
	3.3.4 Staking Pipe Line Grades		9
	3.3.5 Perform demarcation of a sewer line alignment by conventional method	8	
	3.3.6 Perform the staking of invert level of sewer line by using conventional method.		
	3.3.7 Perform alignment and staking invert levels of a sewer line by using laser beam.		
	3.4 Road alignment & Curves		
	3.4.1 Definition, types and necessity of curves		

	3.4.2 Elements and notation of simple circular curves & their relationship		
	3.4.3 Calculation of data & methods of setting out simple circular curves		
	3.4.4 Setting out simple curve beyond obstacles		
	3.4.5 Description, types and necessity of transition curves.		
	3.4.6 Characteristics, elements & notation of transition curve and their inter relationship.		
	3.4.7 Introduction to super elevation and methods of calculation length of transition curve.		9
	3.4.8 Calculation of data and methods of setting out of transition curve		
	3.4.9 Introduction to vertical curves, types of vertical curves, elements, term and their inter relationship.		9
	3.4.10 Calculation of data and setting out vertical curves.		6
	3.4.11 Solve numerical problem regarding computation of data by different methods for setting out circular curve.		9 12
	3.4.12 Solve numerical problem regarding computation of setting out data for transition /combined curve.		12
	3.4.13 Setting out circular curve in field by offset method / by tape.		
	3.4.14 Setting out circular curve by deflection angle method.		12
	3.4.15 Prepare setting data for circular curve and create coordinate data file and perform setting out with Total Station		15

	<p>3.4.16 Prepare data for combined curve, create coordinate data file &amp; perform setting out with Total Station.</p> <p>3.4.17 Prepare data for vertical curve , create coordinate data file and perform lay out of vertical curve.</p> <p>3.4.18 Establish the center line of road and set out graded formation levels.</p>	4	12
3.5	<p>Property Survey</p> <p>3.5.1 Introduction to Land Revenue system of Pakistan</p> <p>3.5.2 Title Transfer of Land Records</p> <p>3.5.3 Explanation of Terminology, Khewat, khatooni and AKS Shajra, Acre Line, Muraba Line</p> <p>3.5.4 Deed Description of Land</p> <p>3.5.5 Land acquisition process</p> <p>3.5.6 Land monuments for property line demarcation</p>		
<b>Sub total</b>		20	180

4	(Unit 11) Basic Quantity surveying		
	4.1. Introduction	3	
	4.1.1 Brief history of quantity Surveying		
	4.1.2 Types of estimates		
	4.1.3 Term used in estimation		
	4.2 Rough Cost Estimates	2	
	4.2.1 Methods of rough cost estimates		
	4.2.2 Basic principles for preparation of rough cost estimates of residential building, commercial building, water supply and sewerage schemes		
	4.2.3 Practice to prepare rough cost estimate of various types of residential and public buildings		4
	4.2.4 Practice to prepare rough cost estimates for a commercial and industrial building with the help of given drawings & data		6
	4.2.5 Practice to prepare rough cost estimate for water supply & sewerage schemes for a small housing colony		6
	4.3 Detailed Estimate (Building)	4	
	4.3.1 Prerequisites, working drawings, specification and schedule of rates etc		
	4.3.2 Market Rate, Labour rates, composite rates		
	4.3.3 Important item of work of building with brief specification, unit of measurements		
	4.3.4 Rules for taking / measuring quantities of item of works		
	4.3.5 Methods of taking out quantities; long and short wall method and center line		18

	<p>method</p> <p>4.3.6 Practice in taking out quantities of work (Excavation, lean concrete, brickwork in foundation, DPC, brickwork in superstructure, surface rendering for straight wall, T, L, H and U shaped wall and circular walls</p> <p>4.3.7 Practice in taking out quantities for simple boundary walls</p> <p>4.3.8 Practice in taking out quantities of all items of works (building portion) of a single room &amp; one room with verandah .</p> <p>4.3.9 Practice of consulting schedule of rates and working out cost for above exercise</p>	4	<p>3</p> <p>15</p> <p>3</p>
	<p>4.4 Earthwork</p> <p>4.4.1 Basic Definitions: Lead, Lift, Borrow Pit, NSL, FL, Gradient, Side Slope, Dead Soldier, Cross Fall, Formation Width, Bed Width</p> <p>4.4.2 Methods of calculating earthwork: average depth method, average x-sectional method, graphical method and coordinate method</p> <p>4.4.3 Volume of Pond: Prismoidal formula, Trapezoidal formula</p> <p>4.4.4 Mass diagram</p> <p>4.4.5 Practice in calculating quantities of earthwork by all above methods for small length of embankment</p> <p>4.4.6 Sketching x-sections, L-sections and marking gradient of prepared road</p>		<p>9</p> <p>9</p> <p>9</p>

	<p>embankment with the help of surveyor data and design data.</p> <p>4.4.7 Compute the earthwork from the above L-section &amp; x-sections of embankment by coordinate method and mean area method.</p> <p>4.4.8 Practice in calculating volume of earthwork in a pond/depression with the help of contour plan.</p> <p>4.4.9 Practice to compute the earthwork volume for road in hilly area.</p>		9
	<p>4.5. Technical Specification</p> <p>4.5.1 Relationship of specification and drawings</p> <p>4.5.2 General specification</p> <p>4.5.3 Detail specification</p> <p>4.5.4 Study of detailed specification of important item of work</p>	3	
	<p>4.6 Methods of Execution of works</p> <p>4.6.1 Construction teams</p> <p>4.6.2 Types of contracts</p> <p>4.6.3 Tender documents</p> <p>4.6.4 Comparative statement</p> <p>4.6.5 Work order / agreement</p>	4	
<b>Sub total</b>		20	100
5	<p>(Unit 12) AutoCAD</p> <p>5.1 Introduction</p> <p>5.1.1 Introduction about software</p> <p>5.1.2 Introduction about graphic user interface</p> <p>5.1.3 Menu bar, Toolbar</p>	1	

	5.1.4 Coordinate system	1	
	5.2 Drawing Objects		
	5.2.1 Line, with rectangular coordinate and polar coordinate		
	5.2.2 Types of lines		
	5.2.3 Circle, arc, polygon, ellipse, blocks		
	5.2.4 Point and Point Style		6
	5.2.5 Practice to draw simple geometrical shapes	2	
	5.3 Modifying Objects		
	5.3.1 Editing Objects (Copy, Erase, Move, rotate and mirror etc)		
	5.3.2 Offset		
	5.3.3 Array (Rectangular & Polar)		
	5.3.4 Trim & extend lines		
	5.3.5 Fillet & Chamfer Edges		
	5.3.6 Explode		
	5.3.7 Break and Break at point, scale and stretch		
	5.3.8 Dimension & dimension styles		2
	5.3.9 Boundary, hatches and gradient enhancement solid fills		2
	5.3.10 Practice to make a plate profile		
	5.3.11 Practice to draw square and circle series by using array command		2
	5.3.12 Practice to make fork profile		2
	5.3.13 Practice to make spring profile		6
	5.3.14 Practice to draw symbols used in building drawing (templates)		6
	5.3.15 Practice to draw surveying symbols (templates)		9
	5.3.16 Practice to draw orthographic views of different, wooden blocks and Label the dimensions	2	



	5.4	Modifying Techniques		
	5.4.1	Color Control		
	5.4.2	Line Types Control and line type scale		
	5.4.3	Line weight		
	5.4.4	Match properties		6
	5.4.5	Property Tool		
	5.4.6	P-Edit, Region and Divide and measure	2	
	5.4.7	Practice of all above commands (Line to polyline, change properties of objects etc.		6
	5.5	Building Drawings		
	5.5.1	Instruction to draw plan & sections of residential buildings	2	
	5.5.2	Draw plan & elevation of two rooms with verandah		
	5.6.	Layout drawing & maps		
	5.6.1	Introduction to draw layout plan of a building		6
	5.6.2	Introduction to draw layout plan of a small housing scheme		12
	5.6.3	Draw location plan, & layout plan for a residential building (5 marla)		3
	5.6.4	Draw layout plan of a small housing society (with the help of given rough sketches)		12
	5.6.5	Practice to calculate the area of different plot and maps and volume of different solids		
	5.6.6	Plotting the map of a small area with the help of surveyor field data.		
<b>Sub total</b>			10	80

6	(Unit 13)Project 6.1 Project Surveys for a housing scheme 6.1.1 Establish control points at site. 6.1.2 Shifting of bench mark 6.1.3 Prepare topographical map of the site 6.1.4 Prepare street maps and perform profile leveling & cross sectioning of major road. 6.1.5 Compute the earth work 6.1.6 Establish the road profile of a sample Length. 6.1.7 Setting out alignment and invert levels of sewer line ( sample length ) 6.1.8 Final report		80
7	Functional English	20	20
8	Work Ethics	-	20
Total		160	640

## **LIST OF TOOLS / EQUIPMENTS ETC.**

(For a class of 25 students)

<b>Name of Trade</b>	<b>Surveyor</b>
<b>Duration of Course</b>	<b>1- Year</b>

### **(a) Surveyor Lab**

<b>S.#</b>	<b>Name of Equipment / Machinery with specifications</b>	<b>Quantity Required</b>
1.	<p><b>Electronic Total Station</b></p> <p>I. Angle Measurement ( Horizontal &amp; Vertical)</p> <ul style="list-style-type: none"><li>• 0 to 360</li><li>• Min. Reading display (selectable) (1"/ 5")</li><li>• Angle measurement accuracy: 5" or better</li><li>• Magnification: 30X - 32X</li><li>• Image: Erect</li><li>• Min. Focusing: 1 to 1.75m</li><li>• Aperture: 40 to 45mm</li></ul> <p>II. Distance Measurement</p> <ul style="list-style-type: none"><li>• Range without prism: 250m-1200m</li><li>• Range with one prism: 2000 to 5000m</li><li>• Accuracy: 2 to 5mm <math>\pm</math> 3PPM</li><li>• Dual Axis Compensator.</li></ul> <p>III. Optical Plummet / Laser.</p> <ul style="list-style-type: none"><li>• Magnification: 2 to 3X</li><li>• Image: Erect.</li></ul> <p>IV. Data Storage / Communication</p> <ul style="list-style-type: none"><li>• Built in memory: 10,000 coordinates points or better</li><li>• Power port RS. 232 (Compatible) / USB.</li></ul> <p>V. Display &amp; Keyboard</p> <ul style="list-style-type: none"><li>• Graphical LCD, both sides</li><li>• Alpha-numeric keyboard.</li></ul> <p>VI. Built in software.</p> <ul style="list-style-type: none"><li>• Compatible with window Environment</li><li>• Data down loading / uploading and processing software</li><li>• Built in program: Area calculation, resections, point to line measurement, MLM, REM, Road design stake out etc.</li><li>• Coordinate acceptance facility.</li></ul> <p>VII. Power Supply</p> <ul style="list-style-type: none"><li>• Re-chargeable Battery Volt: 6 to 12</li><li>• Operating time: 14 Hours (approx)</li></ul> <p>VIII. Accessories</p> <ul style="list-style-type: none"><li>• Tubular/ bar compass: 01 No.</li><li>• Battery Charger: 01No.</li><li>• Spare battery: 02Nos</li></ul>	5

	<ul style="list-style-type: none"> <li>• Detachable Tribrach : 01No</li> <li>• Data transfer cable/USB : 01No.</li> <li>• Aluminum Tripod: 01 No.</li> <li>• Target set (Single person): 3 Sets</li> <li>• Prism, Prism adaptor, Target / reflector, Prism pole, pole stand, bubble and bag.</li> <li>• Target set (Three prism): 01 Set</li> <li>• Consist of: Prism (3Nos.0, prism adopter, Reflector, tribrach with pill bubble, Aluminum tripod and bag.</li> <li>• Instructional Manual</li> <li>• Water proof &amp; shock proof complete with tool kit carrying case and all slandered accessories.</li> </ul>	
--	--	--

2.	<b>Microptic Theodolite</b> <b>I. Telescope</b> <ul style="list-style-type: none"> <li>• Magnification: 28 – 32X</li> <li>• Apparatus: 35-45mm</li> <li>• Image: Erect</li> <li>• Min. Focus: 0.5 to 1.8m</li> <li>• Stadia Constant: 0, 100</li> </ul> <b>II. Angle Measurement: (Horizontal &amp; Vertical)</b> <ul style="list-style-type: none"> <li>• <math>0^{\circ}</math> - <math>36^{\circ}</math></li> <li>• Min. Reading: 20"</li> <li>• Direct digital read out system</li> <li>• Automatic vertical circle indexing</li> </ul> <b>III. Optical Plummet:</b> <ul style="list-style-type: none"> <li>• Magnification (2-3)X</li> <li>• Image: Erect</li> </ul> <b>IV. Accessories:</b> <ul style="list-style-type: none"> <li>• Tool kit containing (Plumb bob, plumb bob hook, adjusting pins, two screw drivers, cleaning brush, etc.)</li> <li>• Trough / Tubular compass (with adaptor)</li> <li>• Aluminium adjustable tripod</li> <li>• Plastic cover</li> <li>• Instruction manual</li> <li>• Carving case</li> <li>• Complete with all standard accessories.</li> </ul>	5
3.	<b>Auto Levels</b> <ul style="list-style-type: none"> <li>• Magnification 28 – 32 X</li> <li>• Image: Erect</li> <li>• compensator type wire-hung/air damping / magnetic</li> <li>• Aperture: 35 – 45 mm</li> <li>• Field of view: <math>1^{\circ}</math> - 20' to <math>1^{\circ}</math> - 30',</li> <li>• Horizontal circle: <math>0^{\circ}</math> - <math>360^{\circ}</math></li> </ul>	5

	<ul style="list-style-type: none"> <li>• Min. Focusing: 0.5 to 1.8 M</li> <li>• Stadia constants: 0, 100</li> <li>• Setting accuracy: 0.2" to 0.5"</li> <li>• Compensation range <math>\pm 12'</math> to <math>30'</math></li> <li>• Accuracy in double run 1 KM leveling, <math>\pm 2</math>mm or better</li> <li>• Circular level sensitivity: <math>8'</math> to <math>10' / 2</math>mm</li> </ul> <p><b>Accessories</b></p> <ul style="list-style-type: none"> <li>• Aluminum adjustable tripod, standard tool kit.</li> <li>• Plumb bob.</li> <li>• Instruction manual</li> <li>• Carrying case.</li> <li>• All standard Accessories</li> </ul>	
4.	<p><b>Laser level</b></p> <ul style="list-style-type: none"> <li>• Including: Receiver, Detector</li> <li>Horizontal accuracy : 1.4mm to 3mm or better</li> <li>Laser Range with detector: 250m to 500m radius.</li> <li>• Rotation speed: 300 – 600r.p.m</li> <li>• Height alert function:</li> <li>Light source – Laser diode (Visible)</li> <li>Beam out put: 0.9W or less</li> <li>Self leveling range: <math>\pm 3^\circ \pm 5^\circ</math></li> <li>Detector: LCD / LED TYPE on Both sides</li> <li>• Detector sensitivity <math>\pm 0.5</math>mm or better</li> <li>• Level tube / Bubble in Built.</li> <li>• Aluminum adjustable tripod</li> <li>• Aluminum leveling staff</li> <li>• Dust and water proof</li> <li>• Operating range: <math>-5</math> to <math>55^\circ\text{C}</math> or higher</li> <li>• Complete with all standard accessory &amp; carrying case</li> </ul>	1
5.	<p><b>LEVELLING STAFF</b></p> <ul style="list-style-type: none"> <li>• Aluminum</li> <li>• Telescopic (3 sections)</li> <li>• 5 M long (double sided)</li> <li>• Graduated in m &amp; ft Read to 5mm , 0.1ft</li> <li>• Push button lock system</li> <li>• Provided with circular bubble</li> </ul>	10
6.	<p><b>PLANE TABLE SET</b></p> <p><b>TABLE</b></p> <ul style="list-style-type: none"> <li>• Made of deodar wood, with metal corners, size 80x60x2cm (32"x24"x <math>\frac{3}{4}</math> ")</li> <li>• Metal, clamp for fixing it on tripod</li> <li>• Heavy duty aluminum tripod.</li> <li>• Adjustable legs with shoe</li> <li>• Alidade Metallic head, shoulders and fly nuts etc.</li> <li>• Metallic/brass, (18" long) graduation one edge,</li> </ul>	06

	<ul style="list-style-type: none"> <li>• Plumbing fork</li> <li>• Trough compass (in aluminum / metal case)</li> <li>• Plumb bob</li> <li>• Circular spirit level etc. complete with all standard accessories.</li> </ul>	
7.	<b>Prismatic Compass with tripod:</b> <ul style="list-style-type: none"> <li>• Size : 6" (15cm)dia Graduation <math>0^{\circ}</math> -<math>360^{\circ}</math></li> <li>• Least count: 20minutes Pill bubble: in built</li> <li>• Prism, sight vane brake pin, lifting pin and lid etc.</li> <li>• Aluminum tripod; adjustable legs and Metallic head (ball coupling type)</li> <li>• Carving case</li> <li>• Complete with standard accessories.</li> </ul>	10
8.	<b>Telescopic Alidade:</b> <ul style="list-style-type: none"> <li>• Image: Erect</li> <li>• Magnification: 08-12X</li> <li>• Aperture: 25mm to 45mm</li> <li>• Minimum Focus: 2m or batter</li> <li>• Stadia constants: 0, 100</li> <li>• Movable Range: 0 to 30mm</li> <li>• Vertical Circle Graduation: Half (<math>0^{\circ}</math> - <math>90^{\circ}</math>) full</li> <li>• Vernior Arm: reading 10'</li> <li>• Alidade – length 20-30cm, beveled edge with detachable scale.</li> <li>• Mounted Pill Bubble.</li> <li>• Complete in carrying case kit and all standard accessories.</li> </ul>	03
9.	<b>Telescope Survey Compass:</b> <b>Telescope</b> <ul style="list-style-type: none"> <li>• Image: Erect</li> <li>• Type: Reversible</li> <li>• Magnification: 08 -12X</li> <li>• Stadia constants: 0, 100</li> <li>• Vertical Circle: Full</li> <li>• Length: 120mm or Higher</li> </ul> <b>Compass</b> <ul style="list-style-type: none"> <li>• Horizontal Circle: 0- <math>360^{\circ}</math></li> <li>• Compass circle dia: 70mm or better</li> <li>• Accuracy: <math>1^{\circ}</math> or better</li> <li>• Pill bubble (Circular bubble)- Built-in</li> <li>• Aluminum tripod; adjustable</li> <li>• Complete with standard Accessories</li> </ul>	5
10.	<b>ENGINEER'S CHAIN</b> <ul style="list-style-type: none"> <li>• 100 ft long</li> <li>• Made of galvanized steel wire, 6 S.W.G</li> <li>• 100 No. links interconnected with rings (each link 1 ft</li> </ul>	5

	c/c) <ul style="list-style-type: none"> <li>• brass made telly markers</li> <li>• Brass swivel handles complete with leather strap.</li> </ul>	
11.	<b>METRIC CHAIN:</b> <ul style="list-style-type: none"> <li>• 30 m long</li> <li>• Made of galvanized steel wire, 6 SWG</li> <li>• 150 links with rings and brass tellies</li> </ul> Complete with brass swivel handles and leather strap	5
12.	<b>GUNTER'S CHAIN</b> <ul style="list-style-type: none"> <li>• 66 ft long</li> <li>• Galvanized / zinc coated steel wire 6 S.W.G</li> <li>• Each link measuring 0.66 ft c/c</li> <li>• Tempered steel wire, 8 SWG</li> <li>• Brass tellers and swivel handles complete with leather strap.</li> </ul>	2
13.	<b>STEEL TAPE</b> <ul style="list-style-type: none"> <li>• Length 30 m, 13 mm wide</li> <li>• stainless steel with vinyl coating</li> <li>• Both face marking, one in m (0.1, 0.01, and 0.005m) and other in ft (inches &amp; half)</li> <li>• first decimeter also marked for 0.001m and Fust ft marked for 1/8 "</li> <li>• button arrangement for quick release / winding</li> <li>• non-corrosive metal cover,</li> </ul>	10
14.	<b>STEEL BAND</b> <ul style="list-style-type: none"> <li>• Length 50m, 13mm wide</li> <li>• Stainless steel with vinyl coating</li> <li>• One side marking of meter, 0.1,0.01 and 0.005m</li> <li>• Zero start from 30cm (approx) away from handle.</li> <li>• Brass handle</li> <li>• Metal cover with handle.</li> </ul>	5
15.	<b>METALLIC TAPE</b> <ul style="list-style-type: none"> <li>• 30 m (100 ft) long</li> <li>• Brass wire woven nylon / cotton, ribbon 2 mm (1/12") wide.</li> <li>• Graduated both in metric and feet units</li> <li>• Complete in plastic case</li> </ul>	10
16.	<b>INVAR TAPE</b> <ul style="list-style-type: none"> <li>• 30 m long, 13mm wide</li> <li>• Made of Invar (alloy of / steel and Nickel).</li> <li>• one ride marking of m, 0.1, 0.01 and 0.005m</li> <li>• With handle on both sides.</li> <li>• Zero start from 30cm away from handle.</li> </ul>	2
17.	<b>ARROWS</b> <ul style="list-style-type: none"> <li>• 30 cm (12") long with one end pointed and other ringed</li> <li>• Made of galvanized tempered steel wire, 06 SWG</li> </ul>	50

18.	<b>RANGING RODS</b> <ul style="list-style-type: none"> <li>Made of mild steel pipe (16SWG) , 1" dia, 6 ft long</li> <li>One end pointed and top end plugged</li> <li>Painted in red or black, and white strips</li> </ul>	50
19.	<b>Ranging Rods(Two pieces)</b> <ul style="list-style-type: none"> <li>Made of aluminum pipe 1" <math>\Phi</math></li> <li>Two piece (5ft + 3ft) screwing arrangement.</li> </ul>	20
20.	<b>CROSS STAFF</b> <ul style="list-style-type: none"> <li>Consisting of octagonal brass box with slits cut in each face, mounted on a 1.25M (4 ft) long rod with shoe at bottom.</li> </ul>	10
21.	<b>OPTICAL SQUARE</b> <ul style="list-style-type: none"> <li>Mirror type</li> <li>10 cm (4") dia, metallic case with handle</li> </ul>	5
22.	<b>OPTICAL Square</b> <ul style="list-style-type: none"> <li>Prism type</li> <li>10 cm (4") dia, metallic case with handle and carrying case complete.</li> </ul>	5
23.	<b>MALLET</b> <ul style="list-style-type: none"> <li>Hardwood head dia 75 mm</li> <li>Complete with handle 400 mm long fixed into the head.</li> </ul>	10
24.	<b>ABNEY'S LEVEL</b> <ul style="list-style-type: none"> <li>Telescope square aluminum body.</li> <li>Magnification: 8 x or better</li> <li>Image: Erect</li> <li>Simi-circle ARC graduated in degree (<math>0^0 + 90^0</math>) and percent (0-100%)</li> <li>Vernier arm reading: 10'</li> <li>Magnifying glass.</li> <li>Carrying case and all standard accesses.</li> </ul>	2
25.	<b>PLUMB BOB</b> <ul style="list-style-type: none"> <li>100-130 gms weight</li> <li>Brass polished</li> <li>Replaceable blued steel pointer</li> <li>Screw cap with strip indicator</li> </ul>	10
26.	<b>BALL PEIN HAMMER</b> <ul style="list-style-type: none"> <li>With wooden handle 300 mm long.</li> <li>Steel made 250 gm weights, semi finish, dropforged.</li> </ul>	5
27.	<b>Leveling Tripod:</b> <ul style="list-style-type: none"> <li>Aluminum, Adjustable lags with metal shoe</li> <li>Metallic head, fly nuts, screw coupling with center hook.</li> </ul>	10
28.	<b>Target Staff:</b> <ul style="list-style-type: none"> <li>Aluminum made. Folding type (Two pieces)</li> <li>Total Length: 3m</li> <li>Graduation: meter</li> <li>Least Count 5mm</li> </ul>	5



	<ul style="list-style-type: none"> <li>• Brass Target with lock nut and Micrometer</li> <li>• Pill bubble with clamp arrangement.</li> </ul>	
29.	<b>Hand Held GPS</b> <ul style="list-style-type: none"> <li>• Black &amp; white / Coloured display</li> <li>• Data cable, Datadown loading GPS to PC</li> <li>• Facilitates for navigation, routes, compass, coordinates, speed of vehicle etc.</li> <li>• Complete with carrying case and all stranded accessories.</li> </ul>	2
30.	<b>Thermometer (Mercury):</b> <ul style="list-style-type: none"> <li>• Glass made -10<sup>0</sup> to 100<sup>0</sup> C<sup>o</sup></li> <li>• Mounted on plastic strip with casing</li> </ul>	5
31.	<b>Spring Balance:</b> <ul style="list-style-type: none"> <li>• Dial gange type with Hook &amp; grip handle.</li> <li>• Dial gauge 0-50kg</li> <li>• Mime reading 200gm</li> <li>• Dia of gauge 15cm or greater.</li> </ul>	5
32.	<b>Barometer:</b> <ul style="list-style-type: none"> <li>• Precision barometer for measuring atmospheric pressure and altitudes.</li> <li>• Fixed dial for pressure meanrenats and rotating dial for altitude calculation</li> <li>• Pressure gauge: 970 – 100kpa</li> <li>• Division 1 hpa</li> <li>• Height Range: 0-6000m</li> <li>• Divion: 10m</li> <li>• Dia of Gauge: 50mm or greater.</li> <li>• Complete carrying case and all standard accessories.</li> </ul>	1

### (b) Computer Application / Auto CAD

Sr. No.	Name of Item with Specifications	Qty
1	<b>Computer</b> Core 2 Quad Q9400 Processor 4GB DDR2-800 RAM 320 GB SATA Hard Drive DVD Writer Standard Key Board Standard Scroll Optical Mouse Wide screen LCD Monitor 10/100 bore-T Ethernet Card Nvidia 512 MB Graphic Card Windows Vista Ultimate	26
2	<b>Net working</b>	-
3	<b>UPS</b> 2000 watt (140 Amp, 2 Batteries)	04
4	<b>Multimedia Projector</b>	01

	Lumen 3000 Lamp life 6000 hrs Resolution (XGA 1024/768, LCD	
5	<b>Scanner A-3</b>	01
6	<b>Printer LaserJet,</b>	01
7	<b>Plotter LaserJet A-0 Size</b>	01
8	<b>License software for education Latest Versions</b>	
	Auto CAD	25
	M.S Office	25

### (C) Drafting Lab / Drawing Hall

Sr. No.	Name of Item with Specifications	Qty
1)	<b>Drafting Table</b> Portable (Taper Type) Table size 32" x 24"	26
2)	<b>Drawing Instruments Box</b> Complete	25 Set
3)	<b>Tee Square</b> (600 mm) Transparent	25Set
4)	<b>Set Square</b> Transparent medium size (300 mm)	25 Set
5)	<b>Templates</b> Circle Square, Hexagon, Triangle (03 each)	05 Set
6)	<b>French Curves</b> Good Quality, medium size	02 Set
7)	<b>Clutch Pencil</b> (0.5 mm)	25
8)	<b>Eraser</b>	25
9)	<b>Sharpener Machine</b>	05
10)	<b>Tri angular scale Rule</b> With six scales	25
11)	<b>Drafting Machine Elbow type</b> Table size A o complete with all accessories	01
12)	<b>Black Board Compass</b> Made of maple/wood, with ring foot of polycarbonate and chalk/marker holder with spring, length : 500-600 mm	02
13)	<b>Black Board Set Squares</b> Crystal Clear Acrylic made, c.m. divisions, angle divisions, handle on the top, three non skid rubber feet on the underside size 650 x 460 x 460 mm, 3 mm thick.	02
14)	<b>Black Board Circular Protector</b> Crystal clear acrylic made, 0° – 360° division 1°, handle on the top, three non skid rubber feet on the under side Size 400mm-450mm.	02

## TEACHING STAFF REQUIREMENT

For class of 25 students

Sr.#	Designation	No.	Qualification & Experience
1	Instructor	1	B.Sc Civil Engineering / B.Tech (Hons) with two year relevant experience well equipped with advanced surveying technique. OR Diploma in surveying from survey of Pakistan with 5 year relevant Experience OR DAE (Civil) with 5 year experience as surveyor
2	Jr. Instructor	1	Diploma in surveying from survey of Pakistan OR DAE (Civil) with one year experience as surveyor.
3	Assistance		Matric with certificate in surveying (Minimum 6 Months) and 2 years experience in survey Company / Survey Projects

## EMPLOYABILITY OF THE PASS OUTS

The pass outs of this course can find job / employment opportunities in the following sections / areas: -

1. Govt. Organizations
2. Semi – Government Organizations
3. Private Organization
4. Construction Industry

## REFERENCE BOOKS

1.     Surveying & Leveling  
      by T.P. Kainatkar & S,V. Kulkarni  
      A.V.G publisher
2.     Surveying & Leveling  
      By N.N BASAK  
      Tata Mc Graw – Hill,
3.     Textbook of Surveying  
      National Book Foundation.
4.     Surveying  
      by A. Bannister, S. Raymond  
      Pearson Education
5.     Practical Field Surveying & computation  
      by A.L Allam.
6.     Surveying with Construction application  
      by Barry F. Kavanagh  
      Pearson prentice Hall.
7.     Introduction to Engineering Mathematics  
      Vol 1 & 2 by H.K. Das S.chand & Co.
8.     Building Drawing  
      by Gurcharn singh.
9.     First year Drawing  
      by Gupta
10.    Computer Application for beginners
11.    Estimation by ALLAH Bakhs Malik
12.    Estimation & Costing by Dutta
13.    Building Construction by Arora & Gupta

## **NAMES OF NATIONAL CURRICULUM & REVIEW COMMITTEE MEMBERS**

1. Muhammad Islam, Principal, Government College of Technology, Multan
2. Sheikh Abdul Karim, Assistant Professor, Government College of Technology, Karachi
3. Imtiaz Ahmed Awan, Senior Instructor (Civil), Government College of Technology, Rasul
4. Nadeem Zaigham, Senior Instructor, Government College of Technology, Raiwind Road, Lahore
5. Engr. Abdul Rashid, Associate Professor, Government College of Technology, Kohat
6. Saad Nazir, Assistant Professor, University of Engineering and Technology, Lahore
7. Engr. Muhammad Shahzad Javed, Research Officer, Punjab Board of Technical Education, Lahore
8. Rahat Asi, Associate Engineer (Survey), NESPAK, H&TED, Lahore
9. Jawaria Qazi, W.A. Punjab Board of Technical Education, Lahore
10. Ch. Muhammad Saleem, Assistant Controller (Examination), Punjab Board of Technical Education, Lahore