

**STATE BOARD OF TECHNICAL EDUCATION, BIHAR**

Scheme of Teaching and Examinations for

**IV<sup>th</sup> Semester Diploma in Civil Engineering / Civil (Rural) Engineering**

(Effective from Session 2020-21 Batch)

**Rev 1.0 THEORY**

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam (ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Hydraulics	2015401	03	03	10	20	70	100	28	40	03
2.	Advance Surveying	2015402	03	03	10	20	70	100	28	40	03
3.	Theory of structure	2015403	03	03	10	20	70	100	28	40	03
4.	Building Planning and Drawing	2015404	03	04	10	20	70	100	28	40	03
5.	Transportation Engineering	2015405	03	03	10	20	70	100	28	40	03
		Total :-	<b>15</b>				<b>350</b>	<b>500</b>			<b>15</b>

**PRACTICAL**

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits
					Internal (PA) A	External (ESE) B			
6.	Hydraulics Lab	2015406	02 50% Physical 50% Virtual	03	15	35	50	20	01
7.	Advance Surveying Lab	2015407	02 50% Physical 50% Virtual	04	15	35	50	20	01
		Total :-	<b>04</b>				<b>100</b>		<b>02</b>

**TERM WORK**

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Marks of Internal Examiner (PA) X	Marks of External Examiner (ESE) Y	Total Marks (X+Y)	Pass Marks in the Subject	Credits	
8.	Theory of structure Lab (TW)	2015408	04	07	18	25	10	02	
9.	Building Planning and Drawing (TW)	2015409	04	15	35	50	20	02	
10.	Transportation Engineering Lab (TW)	2015410	02	07	18	25	10	01	
11.	Course Auto CAD/STAAD. Pro / Others (TW)	2015411	04	15	35	50	20	02	
		Total :-	<b>14</b>			<b>150</b>		<b>07</b>	
Total Periods per week Each of duration One Hour				<b>33</b>	Total Marks =			<b>750</b>	<b>24</b>

# HYDRAULICS

<b>Subject Code</b> <b>2015401</b>	<b>Theory</b>					<b>Credits</b>	
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>			
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>ESE</b>	:	<b>70</b>	<b>03</b>
	<b>03</b>	—	—	<b>TA</b>	:	<b>10</b>	
	—	—	—	<b>CT</b>	:	<b>20</b>	

**Course Objective:**

1. To understand parameters associated with fluid flow and hydrostatic pressure.
2. To know head loss and water hammer in fluid flowing through pipes.
3. To learn different types of pumps and their uses

### CONTENTS: THEORY

	<b>Name of the Topic</b>	<b>Hrs.</b>
Unit -1	<p><b>Pressure measurement and Hydrostatic pressure</b></p> <p>1.1 Technical terms used in Hydraulics—fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics—ideal and real fluid, application of hydraulics.</p> <p>1.2 Physical properties of fluid—density, specific volume, specific gravity, Specific Weight, relative density, compressibility, cohesion, adhesion, surface tension, capillarity, viscosity-Newton’s law of viscosity.</p> <p>1.3 Various types of pressure –Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Conversion from intensity of pressure to pressure head and vice-versa, Formula and Simple problems, Pascal’s law of fluid pressure and its uses.</p> <p>1.4 Measurement of differential Pressure by different methods.</p> <p>1.5 Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls.</p> <p>1.6 Determination of total pressure and center of pressure on sides and bottom Of water tanks, sides and bottom of tanks containing two liquids, vertical surface in contact with liquid on either side.</p>	<b>08</b>
Unit -2	<p><b>Fluid Flow Parameters</b></p> <p>2.1 Types of flow, Gravity and pressure flow, Laminar, Turbulent, Uniform, non-uniform, Steady, Unsteady flow. Reynolds number.</p> <p>2.2 Discharge and its unit, continuity equation of flow.</p> <p>2.3 Energy of flowing liquid: potential, kinetic and pressure energy.</p> <p>2.4 Bernoulli’s theorem: statement, assumptions, equation.</p> <p style="background-color: yellow;">2.5 Application of Bernoulli’s theorem: Venturi meter , Orifice meter, Pitot Tube</p> <p>2.6 Momentum Equation. Simple numerical problems based on above topics.</p>	<b>10</b>

Unit – 3	<p><b>Flow through pipes</b></p> <p>3.1 Major head loss in pipe: Frictional loss and its computation by Darcy’s Weisbach equation, Use of Moody’s Diagram.</p> <p>3.2 Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings.</p> <p>3.3 Flow through pipes in series, pipes in Parallel and Dupuit’s equation for equivalent pipe.</p> <p>3.4 Hydraulic gradient line and total energy line.</p> <p>3.5 Water hammer in pipes: Causes and Remedial measures.</p> <p>3.6 Discharge measuring device for pipe flow: Venturi meter -construction and working.</p> <p>3.7 Discharge measurement using Orifice, Hydraulic Coefficients of Orifice. Simple numerical problems based on above topics.</p>	10
Unit – 4	<p><b>Flow through Open Channel</b></p> <p>4.1 Comparison of Pipe Flow &amp; Open Channel flow.</p> <p>4.2 Classification of Channel, Classification of flow, Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section.</p> <p>4.3 Determination of discharge by Chezy’s equation and Manning’s equation.</p> <p>4.4 Conditions for most economical Rectangular and Trapezoidal channel section.</p> <p>4.5 Specific Energy Diagram, Froude’s Number and its significance.</p> <p>4.6 Critical, Sub-Critical &amp; Super Critical Flow in Channel.</p> <p>4.7 Hydraulic Jump and its occurrence in the field. Practical applications of Hydraulic Jump.</p> <p>4.8 Discharge measuring devices: Triangular and rectangular Notches, Derivation of equations for discharge, Comparison of Rectangular &amp; V-Notch.</p> <p>4.9 Velocity measurement devices: current Meter, floats and Pitot’s tube. Simple Numerical Problems based on above topics.</p>	08
Unit – 5	<p><b>Hydraulic Machines</b></p> <p>5.1 Concept of pump, Types of pump-Centrifugal, Reciprocating, submersible. Advantages &amp; Disadvantages, Priming.</p> <p>5.2 Suction head, delivery head, static head, Manometric head.</p> <p>5.3 Power of centrifugal pump.</p> <p>5.4 Selection and choice of pump.</p> <p>5.5 Turbines: Definition &amp; Types. Difference between Pump &amp; Turbines.</p>	12
	Total	48

**Suggested Text Book:**

1. Modi, P.N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi
2. R.K. Bansal, A Text book of Fluid Mechanics & Hydraulic Machines, Laxmi Publications Pvt. Ltd.
3. R.L. Anand, Hydraulics, Foundation Publishing House.

**COURSE OUTCOMES (COs):**

- 1: Measure pressure and determine total hydrostatic pressure for different conditions.
- 2: Understand various parameters associated with fluid flow.
- 3: Determine head loss of fluid flow through pipes.
- 4: Find the fluid flow parameters in open channels.
- 5: Select relevant hydraulic pumps for different applications.

**CO PO MAPPING**

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015401.01	Measure pressure and determine total hydrostatic pressure for different conditions	3	2	-	-	1	-	-
C2015401.02	Understand various parameters associated with fluid flow.	3	1	1	-	-	-	2
C2015401.03	Determine head loss of fluid flow through pipes.	3	2	-	-	-	-	1
C2015401.04	Find the fluid flow parameters in open channels.	3	2	1	1	1	-	-
C2015401.05	Select relevant hydraulic pumps for different applications.	2	1	-	-	-	1	2
Average		2.8	1.6	1	1	1	1	1.66

## ADVANCE SURVEYING

<b>Subject Code 2015402</b>	<b>Theory</b>						<b>Credits</b>
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>			<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>ESE</b>	<b>:</b>	<b>70</b>	<b>03</b>
	<b>03</b>	—	—	<b>TA</b>	<b>:</b>	<b>10</b>	
	—	—	—	<b>CT</b>	<b>:</b>	<b>20</b>	

### Course Objective:

- To know methods of plane surveying and Theodolite surveying and their uses.
- To learn tacheometric surveying and curve setting
- To understand the principles of Electronic Distance Measurement equipment and total station and their use.
- To know the concept of remote sensing, GPS and GIS

### Contents: Theory

	Name of the Topic	Hrs.
Unit -1	<p><b>Plane Table Surveying:</b></p> <p>1.1 Principles of plane table survey. Accessories of plane table and their use, Telescopic alidade.</p> <p>1.2 Setting of plane table; Orientation of plane table - Back sighting and Magnetic meridian method.</p> <p>1.3 Methods of plane table surveys-Radiation, Intersection and Traversing. Merits and demerits of plane table survey.</p>	10
Unit -2	<p><b>Theodolite Surveying:</b></p> <p>2.1 Types and uses of Theodolite, Components of transit Theodolite and their functions, Reading the Vernier of transit Theodolite.</p> <p>2.2 Temporary adjustment of transit Theodolite.</p> <p>2.3 Measurement of horizontal angle-Direct and Repetition method, Errors eliminated by method of repetition.</p> <p>2.4 Measurement of vertical Angle.</p> <p>2.5 Traverse computation-Latitude, Departure, Consecutive coordinates, independent coordinates, balancing the traverse by Bowditch's rule and Transit rule, Gale's Traverse table computation.</p>	12
Unit – 3	<p><b>Tacheometric Surveying and Curve Setting:</b></p> <p>3.1 Principles of Tacheometry, Tacheometer and its component parts, Anallatic lens.</p> <p>3.2 Tacheometric formula for horizontal distance with telescope horizontal and staff vertical.</p> <p>3.3 Field method for determining constants of tacheometer, determining horizontal and vertical Distances with tacheometer by fixed Hair method and staff held vertical, Limitations of tacheometry.</p> <p>3.4 Types of curves used in roads and railway alignments. Designation of curves. Setting simple circular curve by offsets from long chord and Rankine's method of deflection angles.</p>	10

Unit – 4	<b>Advance Surveying Equipment's:</b> 4.1 Principle of Electronic Distance Meter (EDM) its component parts and their Functions use of EDM. 4.2 Use of Electronic Digital Theodolite. 4.3 Use of Total Station, Use of function keys. 4.4 Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station, Traversing, Profile Survey and Contouring with Total Station.	08
Unit – 5	<b>Remote Sensing, GPS and GIS:</b> 5.1 Remote Sensing – Overview, Remote sensing system, Applications of remote sensing in Civil engineering. 5.2 Use of Global Positioning System (G.P.S.) instruments. 5.3 Geographic Information System (GIS): Over view, Components, Applications, Software for GIS. 5.4 Introduction to Drone Surveying.	08
	<b>Total</b>	<b>48</b>

#### **COURSE OUTCOMES (COs):**

- Prepare plans using Plane Table Surveys.
- Prepare plans using Theodolite surveys.
- Find distances and elevations using Tacheometer.
- Prepare plans using Total Station instrument.
- Locate coordinates of stations using GPS.

#### **CO PO MAPPING**

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015402.01	Prepare plans using Plane Table Surveys.	-	-	-	-	3	-	1
C2015402.02	Prepare plans using Theodolite surveys	1	3	-	-	-	-	-
C2015402.03	Find distances and elevations using Tacheometer	1	3	-	-	-	-	-
C2015402.04	Prepare plans using Total Station instrument	2	-	-	2	-	-	-
C2015402.05	Locate coordinates of stations using GPS.	-	-	1	3	1	-	-
Average		1.33	3	1	2.5	2		1

#### **Suggested Text Book/Reference Book:**

1. Kanetkar T.P.; Kulkarni S.V., Surveying and Levelling PartlandII, Pune Vidyarthi Gruh Prakashan, Pune.
2. Basak N.N., Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd., Noida.
3. Duggal S.K., Survey I and Survey II, Tata Mc Graw Hill Education Pvt. Ltd. Noida.
4. Saikia MD.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punnia, B.C., Jain, Ashok Kumar, Jain Arun Kumar, Surveying Vol-I and II, Laxmi, Publication Pvt. Ltd, New Delhi.
7. Sweta Kumari, Advance Surveying, FPH
8. P.L. Bhatia, Advance Surveying, FPH

## THEORY OF STRUCTURE

Subject Code <b>2015403</b>	Theory					Credits <b>03</b>	
	No. of Periods Per Week			Full Marks	:		100
	L	T	P/S	ESE	:		70
	03	—	—	TA	:		10
	—	—	—	CT	:	20	

### Course Objective:

- To learn concept of eccentric loading and stresses in vertical members like column, chimneys, dam.
- To analyze beams using various methods like slope deflection, three moment and moment distribution.
- To understand different methods of finding axial forces in trusses.

### Contents: Theory

Name of the Topic		Hrs.
Unit -1	<b>Direct and Bending stresses in Vertical members:</b> 1.1 Concept of direct and eccentric loads, eccentricity about one principal axis, nature of stresses, maximum and minimum stresses, resultant stress distribution diagram. 1.2 Condition for no tension or zero stress at extreme fiber, Limit of eccentricity, core of section for rectangular and circular cross sections, Middle third rule. 1.3 Column, pillar, chimney of uniform cross section subjected to lateral wind pressure, Coefficient of wind resistance & resultant stress distribution at their bases.	08
Unit -2	<b>Slope and deflection:</b> 2.1 Concept of slope and deflection, stiffness of Beam. 2.2 Relation between bending moment, slope, deflection & radius of curvature (no derivation) 2.3 Double integration method to find slope and deflection of simply supported and cantilever beam subjected to concentrated and uniformly distributed load. 2.4 Macaulay method to find slope and deflection of simply supported and cantilever beam subjected to concentrated and uniformly distributed load.	10
Unit – 3	<b>Fixed and continuous Beam:</b> 3.1 Different types of Determinate & Indeterminate Structures & Stability of structure. 3.2 Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam over simply supported beam. 3.3 Principle of superposition, Fixed end moments from first principle for beam subjected to point load, UDL over entire span. 3.4 Application of standard formulae in finding end moments, end reactions and drawing S.F. and B.M. diagrams for a fixed beam. (Derivation need not to be asked in exam). 3.5 Clapeyron's theorem of three moments (no derivation). Application of theorem maximum up to three spans and two unknown support moment only, Support at same level, spans having same & uniform moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span. 3.6 Drawing SF & BM diagrams showing point of contra flexure for continuous beams.	14
Unit – 4	<b>Moment distribution method:</b> 4.1 Introduction, sign convention. 4.2 Carryover factor, stiffness factor, Distribution factor. 4.3 Application of moment distribution method for various types of continuous beams subjected to concentrated loads and uniformly distributed load over entire span having same or different moment of inertia up to three spans and two unknown support moment only.	10
Unit – 5	<b>Simple trusses:</b> 5.1 Types of trusses (Simple, Fink, compound fink, French truss, pratt truss, Howe truss, North light truss, King post and Queen post truss). 5.2 Calculate support reactions for trusses subjected to point loads at joints 5.3 Calculate forces in members of truss using Method of joint and Method of sections.	06
<b>Total</b>		<b>48</b>

**COURSE OUTCOMES (COs):**

1. Analyze stresses induced in vertical member subjected to direct and bending loads.
2. Analyze slope and Deflection in fixed and continuous beams. and compare with permissible limits according to IS code
3. Analyze continuous beam using Moment Distribution Method under different loading conditions.
4. Evaluate axial forces in the members of simple truss.

**CO PO MAPPING**

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015403.01	Analyze stresses induced in vertical member subjected to direct and bending loads	2	3	-	-	-	-	-
C2015403.02	Analyze slope and Deflection in fixed and continuous beams. and compare with permissible limits according to IS code	1	3	1	-	2	-	1
C2015403.03	Analyze continuous beam using Moment Distribution Method under different loading conditions.	2	3	1	-	-	-	-
C2015403.04	Evaluate axial forces in the members of simple truss.	1	3	3	-	-	-	2
Average		1.5	3	1.66		2		1.5

**Suggested Text Book:**

1. Theory of structures, S. Ramam ratham, Dhanpat rai & Sons.
2. Mechanics of structures, S. B. Junnarkar Charotar Publishing House, Anand.
3. Analysis of Structures V.N. Vazirani & M.M. Ratwani
4. Theory of Structures R.S. Khurmi, S. Chand and Co., New Delhi.
5. Theory of Structure, R.S. Guha, FPH



## BUILDING PLANNING AND DRAWING

<b>Subject Code 2015404</b>	<b>Theory</b>			<b>Credits</b>			
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>	<b>03</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>ESE</b>	<b>:</b>	<b>70</b>	
	<b>03</b>	—	—	<b>TA</b>	<b>:</b>	<b>10</b>	
	—	—	—	<b>CT</b>	<b>:</b>	<b>20</b>	
—	—	—	—	—	—		

### Course Objective:

1. To learn basic principles of building planning and drawing.
2. To know graphical representation of various components of buildings.
3. To draw complete plan and elevation of a building.
4. To learn basics of perspective drawings and Computer Aided Drawings

### Contents: Theory

Name of the Topic		Hrs.
Unit -1	<p>Conventions and Symbols:</p> <p>1.1 Conventions as per IS 962, symbols for different materials such as earth work, brick work, Stone work, concrete, wood work and glass.</p> <p>1.2 Graphical symbols for doors and windows, Abbreviations, symbols for sanitary and electrical installations.</p> <p>1.3 Types of lines-visible lines, Centre line, hidden line, section line, dimension line, extension line, pointers, arrow head or dots. Appropriate size of lettering and numerals for titles, sub-titles notes and dimensions.</p> <p>1.4 Types of scale, criteria for Proper Selection of scale for various types of drawing.</p> <p>1.5 Sizes of various standard papers/sheets.</p>	04
Unit -2	<p>Planning of Building:</p> <p>2.1 Principles of planning for Residential and Public building- Aspect, Prospect Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy.</p> <p>2.2 Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962.</p> <p>2.3 Rules and bye-laws of sanctioning authorities for construction work.</p> <p>2.4 Plot area, built up area, super built-up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio).</p> <p>2.5 Line plans for residential building of minimum three rooms including water closet (WC), bath and stair case as per principles of planning.</p> <p>2.6 Line plans for public building-school building, primary health centre, hostel and Library.</p>	10
Unit – 3	<p>Drawing of Load Bearing Structure:</p> <p>3.1 Drawing of Single-story Load Bearing residential building (2BHK) with staircase.</p> <p>3.2 Data drawing–plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement, Planning and design of stair case- Rise and Tread for residential and public building.</p> <p>3.3 Working drawing–developed plan, elevation, section passing through stair case or WC and bath.</p> <p>Foundation plan of Load bearing structure.</p>	16

Unit – 4	Drawing of Framed Structure: 4.1 Drawing of Two storied Framed Structure (G+1), residential building (2 BHK) with staircase. 4.2 Data drawing–developed plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement. 4.3 Working drawing of Framed Structure –developed plan, elevation, section passing through stair case or WC and bath. 4.4 Foundation plan of Framed Structure. 4.5 Details of RCC footing, Column, Beam, Chajjas, Lintel, Stair case and slab. 4.6 Drawing with CAD-Draw commands, modify commands, layer commands.	14
Unit – 5	Perspective Drawing: 8.1 Definition of perspective drawing, Types of perspective, terms used in perspective drawing, principles used in perspective drawing. 8.2 Two Point Perspective of small objects only such as steps, monuments, pedestals.	04
	<b>Total</b>	<b>48</b>

#### **COURSE OUTCOMES (COs):**

1. Interpret the symbols, signs and conventions from the given drawing.
2. Prepare line plans of residential and public buildings using principles of planning.
3. Prepare submission and working drawing for the given requirement of Load Bearing structure
4. Prepare submission and working drawing using CAD for the given requirement of Frame structure
5. Draw two-point perspective drawing for given small objects.

#### **CO PO MAPPING**

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015404.01	Interpret the symbols, signs and conventions from the given drawing	2	2	-	-	-	-	-
C2015404.02	Prepare line plans of residential and public buildings using principles of planning	2	2	3	-	-	-	-
C2015404.03	Prepare submission and working drawing for the given requirement of Load Bearing structure	2	2	3	2	1	-	-
C2015404.04	Prepare submission and working drawing using CAD for the given requirement of Frame Structure	2	-	-	3	-	-	-
C2015404.05	Draw two-point perspective drawing for given small objects.	2	-	-	-	-	-	2
Average		2	2	3	2.5	1		2

#### **Suggested Text Book/ Reference Book:**

2. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd New Asian Publishers, New Delhi.
3. M.G. Shah and C.M. Kale, Principles of Perspective Drawing, McGraw Hill Publishing company Ltd. New Delhi.
4. Swamy, Kumara; Rao,N, Kameshwara ,A. Building Planning and Drawing, Charotar Publication, Anand.
5. Bhavikatti, S.S., Building Construction, Vikas Publication House Pvt. Ltd., New Delhi.
6. Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.
7. Singh, Ajeet, Working withAutoCAD2000, McGraw Hill Publishing company Ltd. New Delhi.  
Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi
8. R.P. Duggal, Building Planning and Drawing, FPH

## TRANSPORTATION ENGINEERING

<b>Subject Code 2015405</b>	<b>Theory</b>						<b>Credits</b>
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>	<b>03</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>ESE</b>	<b>:</b>	<b>70</b>	
	<b>03</b>	—	—	<b>TA</b>	<b>:</b>	<b>10</b>	
	—	—	—	<b>CT</b>	<b>:</b>	<b>20</b>	

### Course Objective:

1. To identify the types of roads as per IRC recommendations.
2. To understand the geometrical design features of different highways.
3. To perform different tests on road materials.
4. To identify the components of railway tracks

### Contents: Theory

<b>Name of the Topic</b>	<b>Hrs.</b>
<b>Unit -1</b> <b>Over view of Highway Engineering</b> 1.1 Role of transportation in the development of nation, Scope and Importance of roads in India. 1.2 Different modes of transportation– land way, waterway, airway. Merits and demerits of roadway and railway. 1.3 General classification of roads. 1.4 Selection and factors affecting road alignment.	04
<b>Unit -2</b> <b>Geometric Design of Highway</b> 2.1 Camber: Definition, purpose, types as per IRC–recommendations. 2.2 Kerbs: Road margin, road formation, right of way. 2.3 Design speed and various factors affecting design speed as per IRC–Recommendations. 2.4 Gradient: Definition, types as per IRC–Recommendations. 2.5 Sight distance: Definition, types as per IRC–recommendations, Simple numerical. 2.6 Curves: Necessity, types: Horizontal, vertical curves. 2.7 Extra widening of roads: numerical examples. 2.8 Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation. 2.9 Standards cross-sections of national highway in embankment and cutting.	12

Unit – 3	<p><b>Construction of Road Pavements</b></p> <p>3.1 Types of road materials and their Tests–Test on aggregates-Flakiness and Elongation Index tests, Angularity Number test, test on Bitumen-penetration, Ductility, Flash and Fire point test and Softening point test.</p> <p>3.2 Pavement–Definition, Types, Structural Components of pavement and their functions.</p> <p>3.3 Construction of WBM road. Merits and demerits of WBM road.</p> <p>3.4 Construction of Flexible pavement/Bituminous Road, Types of Bitumen and its properties.</p> <p>3.5 Cement concrete road-methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concrete roads. Types of joints.</p>	10
Unit – 4	<p><b>Basics of Railway Engineering</b></p> <p>4.1 Classification of Indian Railways, zones of Indian Railways.</p> <p>4.2 Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge.</p> <p>4.3 Rail, Rail Joints-requirements, types.</p> <p>4.4 Creep of rail: causes and prevention.</p> <p>4.5 Sleepers-functions and Requirement, types- concrete sleepers and their density.</p> <p>4.6 Rail fixtures and fastenings –fish plate, spikes, bolts, keys, bearing plates.</p>	10
Unit – 5	<p><b>Track geometrics, Construction and Maintenance</b></p> <p>5.1 Alignment-Factors governing rail alignment.</p> <p>5.2 Track Cross sections–standard cross section of single and double line in cutting and embankment. Important terms- permanent land, formation width, side drains.</p> <p>5.3 Railway Track Geometrics: Gradient, curves-types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, can't deficiency, negative cant, coning of wheel, tilting of rail.</p> <p>5.4 Branching of Tracks, Points and crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle.</p> <p>5.5 Station -Purpose, requirement of railway station, important technical terms, types of railway station, factors affecting site selection for railway station.</p> <p>5.6 Station yard: Classification –Passenger, goods, locomotive and marshalling yards. Function &amp; draw backs of marshalling yards.</p>	12
	Total	48

**COURSE OUTCOMES (COs):**

1. Identify the types of roads as per IRC recommendations.
2. Implement the geometrical design features of different highways.
3. Perform different tests on road materials.
4. Identify the components of railway track.
5. Identify the defects in railway track

**CO PO MAPPING**

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015405.01	Identify the types of roads as per IRC recommendations.	3	3	-	-	-	-	1
C2015405.02	Implement the geometrical design features of different highways	3	-	3	-	-	-	-
C2015405.03	Perform different tests on road materials.	3	-	-	3	-	-	-
C2015405.04	Identify the components of railway track.	3	2	-	-	-	-	-
C2015405.05	Identify the defects in railway track	3	2	-	-	2	-	1
Average		3	2.33	3	3	2		1

**Suggested Text Book:**

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi
2. Khanna S.K. Justo, CEG and Veeraragavan, A, Highway Engineering, Nem Chand and Brothers, Roorkee.
3. Arora, N.L. Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena SC and Arora SP, A Text book of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Eng., Standard Book House, New Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand Publication, New Delhi
7. Sweta Kumari , Transportation Engineering , FPH

## HYDRAULICS LAB

Subject Code 2015406	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S		:		
	—	—	02	Internal(PA)	:	15	
-	-	-	External(ESE)	:	35		

### Course Objective:

- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn different types of pumps and their uses.

### Contents: Practical

#### Perform any eight experiments

1. Use piezometer to measure pressure at a given point.
2. Use Bourdon's Gauge to measure pressure at a given point.
3. Use U tube differential manometer to measure pressure difference between two given points.
4. Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.
5. Use Reynold's apparatus to determine type of flow.
6. Use Friction factor Apparatus to determine friction factor for a given pipe.
7. Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
8. Determine the coefficient of discharge for a given Venturi meter.
9. Determine the hydraulic coefficients for sharp edge orifice.
10. Use Current meter to measure the velocity of flow of water in open channel.
11. Use Pitot tube to measure the velocity of flow of water in open channel.
12. Use triangular notch to measure the discharge through open channel.
13. Use Rectangular notch to measure the discharge through open channel.
14. Determine the Manning's constant or Chezy's constant for given rectangular channel section.
15. Study & use of water meter.
16. Study of a model of centrifugal and reciprocating pump.

### Practical Outcomes:

- Measure pressure and determine total hydrostatic pressure for different conditions.
- Understand various parameters associated with fluid flow.
- Determine head loss of fluid flow through pipes.
- Find the fluid flow parameters in open channels.
- Select relevant hydraulic pumps for different applications.

## **CO PO MAPPING**

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015406.01	Measure pressure and determine total hydrostatic pressure for different conditions.	3	2	2	3	2	-	1
C2015406.02	Understand various parameters associated with fluid flow.	3	2	-	-	-	-	-
C2015406.03	Determine head loss of fluid flow through pipes.	3	2	2	3	2	-	1
C2015406.04	Find the fluid flow parameters in open channels.	3	2		3	1	-	-
C2015406.05	Select relevant hydraulic pumps for different applications.	3	2	2	3	2	-	2
Average		3	2	2	3	1.75	-	1

### **Suggested Text Book:-**

1. Hydraulics Laboratory, Rao & Hasan, New Height Publication
2. Ghosh and Talapohia- Experimental Hydraulic-Khanna Publishers- New Delhi
3. Hydraulic Lab Manual Compiled -T.T.T.I.- Chennai-113

## ADVANCE SURVEYING LAB

<b>Subject Code</b> <b>2015407</b>	<b>Practical</b>						<b>Credits</b>
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>	<b>01</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>		<b>:</b>		
	—	—	<b>02</b>	<b>Internal(PA)</b>	<b>:</b>	<b>15</b>	
-	-	-	<b>External(ESE)</b>	<b>:</b>	<b>35</b>		

### Course Objective:

- To know methods of plane surveying, Theodolite surveying and their uses.
- To learn tacheometric surveying and curve setting.
- To understand the principles of Electronic Distance Measurement and Total station and their uses.
- To know the concept of Remote Sensing, GPS and GIS.

### Contents: Practical

#### Perform any eight experiments:

1. Use plane table survey to prepare plans of a plot of seven sided closed traverse by Radiation Method.
2. Use plane table survey to prepare plans, locate details by Intersection Method.
3. Use plane table survey to prepare plans, locate details by Traversing Method.
4. Use plane table survey to carry out Survey Project for closed traverse for minimum five sides around a building.
5. Use transit theodolite to measure Horizontal and Vertical angle by Direct Method.
6. Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Theodolite Survey Project.
7. Use Theodolite as a Tacheometer to compute reduced levels and horizontal distances.
  
8. Set out a circular curve by Rankine's Method of Deflection Angles.
9. Use micro optic Theodolite to Measure Horizontal angle by Direct Method.
10. Use EDM to measure horizontal distance.
11. Use Total station instrument to measure horizontal distances.
12. Use Total station instrument to measure vertical angle.
13. Use Total station instrument to carry out Survey Project for closed traverse for minimum five sides.
14. Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Total Station Survey Project.
15. Use GPS to locate the coordinates of a station.

### Practical Outcomes:

- Prepare plans using Plane Table Surveys.
- Prepare plans using Theodolite surveys.
- Find distances and elevations using Tacheometer.
- Make measurements using Total Station.
- Locate coordinates of survey stations using GPS

### CO PO MAPPING

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015407.01	Prepare plans using Plane Table Surveys.	3	-	-	1	-	2	2
C2015407.02	Prepare plans using Theodolite surveys.	3	-	-	1	-	2	2
C2015407.03	Find distances and elevations using Tacheometer.	3	2	1	-	-	1	-
C2015407.04	Make measurements using Total Station.	-	2	1	-	1	-	-



C2015407.05	Locate coordinates of survey stations using GPS	3	-	-	2	-	1	1
Average		3	2	1	1.33	1	1.5	1.66

**Reference Book :**

1. Kanetkar, T.P.; Kulkarni, S.V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
2. Basak, N.N., Surveying and Levelling, McGraw Hill Education (India) Pvt.Ltd., Noida.
3. Duggal , S.K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, MD.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.

## THEORY OF STRUCTURE LAB (TW)

<b>Subject Code 2015408</b>	<b>Practical</b>			<b>Credits</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>25</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Internal</b>	<b>:</b>	<b>07</b>
	—	—	<b>04</b>	<b>External</b>	<b>:</b>	<b>18</b>
	-	-	-		<b>:</b>	
					<b>02</b>	

### Course Objective:

1. To understand and analyze stress & strain, shear force & bending moment.
2. To study behavior of column.
3. To learn hinge action.
4. To analyze deflection of beams

### Contents: Practical

1. To Verify Strain in an externally loaded beam with the help of a strain gauge indicator and to verify theoretically.
2. To study behavior of different types of Columns: (i) Both ends fixed (ii) One end fixed and other Pinned (iii) Both ends pinned (iv) One end fixed and other free.
3. To find Euler's buckling load for different types of Columns: (i) Both ends fixed (ii) One end fixed and other pinned. (ii) Both ends pinned (iv) One end fixed and other free.
4. To Study two hinged arch for the horizontal displacement of the roller end for a given system of loading and to compare the same with those obtained analytically.
5. Determination of Shear force and bending moment of beam.
6. Compression test on metal.
7. Determination of deflection of beam.
8. Determination of moment of Inertia of fly wheel.

### Practical Outcomes:

1. Interpret shear force & bending moment.
2. Interpret buckling of column.
3. Interpret the result of hinge action.

### CO PO MAPPING

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015408.01	Interpret shear force & bending moment.	2	—	3	3	2	—	—
C2015408.02	Interpret buckling of column.	2	3	3	2	—	—	—
C2015408.03	Interpret the result of hinge action.	2	3	3	2	—	—	1
Average		2	3	3	2.33	2		1

### Text Book/ Reference Book:

1. Theory of structures, S. Ramam rut ham, Dhan Patrai & Sons.
2. Mechanics of structures, S.B. Junnarkar, Charotar publishing House, Anand

## BUILDING PLANNING AND DRAWING (TW)

Subject Code 2015409	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	02
	L	T	P/S	Internal(PA)	:	15	
	—	—	04	External(ESE)	:	35	
-	-	-	-	:	-		

### Course Objectives:

- To learn the basic principles of building planning and drawing.
- To make graphical representation of various components of buildings.
- To draw complete plan and elevation of a building.
- To learn basics of perspective drawings and Computer Aided Drawings.

### Contents: - Term Work

1. Draw various types of lines, graphical symbols for materials, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962.
2. Draw line plan of an existing building to the suitable scale.
3. Draw line plans to suitable scale for any one Public Buildings from the following (School Building, Primary Health Centre, Hostel and Library).
4. Draw submission drawing to the scale 1:100 of a single storey load bearing residential building (2BHK) with flat roof and staircase showing:
  - (a) Developed plan and elevation
  - (b) Foundation plan
  - (c) Site plan (1:200), area statement
5. Draw submission drawing to the scale of 1:100 of (G+1) Framed Structure Residential Building (2BHK) with flat roof and staircase showing:
  - a) Developed plan.
  - b) Elevation.
  - c) Site plan (1:200) and area statement.
6. Draw the above mentioned drawing at serial number 05 using CAD software and enclose the print out.
  - a) Developed plan.
  - b) Elevation.
  - c) Section passing through Staircase.
  - d) Foundation plan.
  - e) Site plan (1:200), area statement.
7. Draw working drawing for above mentioned drawing at serial number 05 showing:
  - a) Foundation plan to the scale 1:50
  - b) Detailed enlarged section of RCC column and footing with plinth filling.
  - c) Detailed enlarged section of RCC Beam, Lintel and Chajjas.
  - d) Detailed enlarged section of RCC staircase and slab.
8. Draw two point perspectives drawing of small objects - steps, monuments, pedestals (any one) scale 1:50
  - a) Draw plan, elevation, eye level, picture plane and vanishing points
  - b) Draw perspective view.

**Practical outcomes:**

- Interpret the symbols, signs and conventions from the given drawing.
- Prepare line plans of residential and public buildings using principles of planning.
- Prepare working drawing for the given requirement of Load Bearing Structure.
- Prepare working drawing using CAD for the given requirement of Framed Structure.
- Draw two-point perspective drawing for given small objects.

**CO PO MAPPING**

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015409.01	Interpret the symbols, signs and conventions from the given drawing.	3	–	–	–	–	–	1
C2015409.02	Prepare line plans of residential and public buildings using principles of planning	–	3	–	–	2	–	–
C2015409.03	Prepare working drawing for the given requirement of Load Bearing Structure	–	3	–	–	–	2	1
C2015409.04	Prepare working drawing using CAD for the given requirement of Framed Structure	–	3	–	2	–	–	–
C2015409.05	Draw two-point perspective drawing for given small objects.	3	–	2	–	–	–	–
Average		3	3	2	2	2	2	1

**Text Book/ Reference Book:**

1. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing
2. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd
3. M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill
4. Swamy, Kumara; Rao, N, Kameshwara, A., Building Planning and Drawing, Charotar Publication, Anand.
5. Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.
6. Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.
7. Singh, Ajit, Working with Auto CAD 2000, Mcgraw Hill Publishing company Ltd.
8. Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

## TRANSPORTATION ENGINEERING (TW)

<b>Subject Code</b> <b>2015410</b>	<b>Term Work</b>			<b>Credits</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>25</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Internal(PA)</b>	<b>:</b>	<b>07</b>
	—	—	<b>02</b>	<b>External(ESE)</b>	<b>:</b>	<b>18</b>
						<b>01</b>

### Course Objective:

1. To identify the types of roads as per IRC recommendations.
2. To understand the geometrical design features of different highways.
3. To perform different tests on road materials.
4. To identify the components of railway tracks.

### CONTENTS: -TERM WORK

#### Perform any eight Experiments / Study

1. Draw the sketches showing standard cross sections of Express ways, NH, SH,MDR, ODR.
2. Flakiness and Elongation Index of aggregates.
3. Angularity Number of aggregates.
4. Aggregate impact test.
5. Los Angeles Abrasion test.
6. Aggregate crushing test.
7. Penetration test of bitumen.
8. Softening point test of bitumen.
9. Ductility test of Bitumen.
10. Visit the road of any one type (flexible or rigid) to know the drainage condition.
11. Visit to railway track for visual in section of fixtures, fasteners and yards.

### Practical Outcomes:

1. Identify the types of roads as per IRC recommendations.
2. Implement the geometrical design features of different highways.
3. Perform different tests on road materials.
4. Identify the components of railway track.
5. Identify the defects in railway track

### CO PO MAPPING

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015410.01	Identify the types of roads as per IRC recommendations.	3	2	—	—	-	—	1
C2015410.02	Implement the geometrical design features of different highways.	—	3	—	—	2	—	1
C2015410.03	Perform different tests on road materials.	—	—	3	3	2	—	—
C2015410.04	Identify the components of railway track.	3	—	1	—	-	—	—
C2015410.05	Identify the defects in railway track	—	3	—	—	2	1	1
Average		3	2.66	2	1.5	2	1	1

### Reference Book:

1. L.R.Kadiyali,TransportationEngineering,KhannaBookPublishingCo.,NewDelhi
2. Khanna S.K., Justo, CEG and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
3. Arora, N.L. Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena SC and Arora SP, A Text book of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Eng., Standard Book House, Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand
7. Duggal, Ajay K. and Puri, V.P., Laboratory Manual in Highway Engineering ,New Age International (P)Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbors Engineering, SciTech Publications, Hyderabad

**TERM WORK**  
**COURSE AUTO CAD/STAAD. PRO / OTHERS (TW)**

Subject Code 2015411	Term Work					Credits 02
	No. of Periods Per Week			Full Marks		
	L	T	P/S	Internal (PA)	External (ESE)	
	—	—	04	:	50	
				:	15	
				:	35	

**Course Objectives:**

Following are the objectives of this course:

- To learn the basic principles of CAD software.
- To understand the AutoCAD workspace and user interface.
- To draw complete plan, section and elevation of a civil engineering structure like building etc using AutoCAD.
- To read various drawings through Computer Aided Drawing software.

**CONTENTS: TERM WORK**

1	<ul style="list-style-type: none"> <li>• <b>Getting Started with AutoCAD:</b> Introduction, Installing and Starting the Software, User Interface, Working with Commands, Cartesian Workspace, Opening an Existing Drawing File, UCS icon, Viewing Your Drawing, Saving Your Work.</li> <li>• <b>Basic Drawing and Editing Commands:</b> Drawing Lines, Erasing Objects, Drawing Vertical and Horizontal Lines, Drawing Rectangles/circles, Undo and Redo Actions, create a Simple Drawing and shapes, Erase, Delete command.</li> <li>• <b>Making Changes in Your Drawing:</b> Selecting Objects for Editing, Moving Objects, Copying, Rotating, Scaling, Mirroring Objects, Drawing Arcs, Polylines, Polygons, Ellipses etc.</li> <li>• <b>Advanced Editing Commands:</b> Trimming and Extending Objects, Stretching Objects, Creating Fillets and Chamfers, Offsetting Objects, Creating Arrays of Objects, Working with Annotations, Adding Text in a Drawing, Modifying Multiline Text, Formatting Multiline Text, Creating Tables, Modifying Tables, Dimensioning- Adding Linear Dimensions, Adding Radial and Angular Dimensions, Hatching, Viewports and Layers.</li> <li>• <b>Creating 1D, 2D and 3D Models.</b></li> </ul>
2	Draw various types of lines, graphical symbols for materials, doors and windows and write abbreviations as per IS 962-1989 (Reaffirmed 2001) using AutoCAD software.
3	Create a line plan of an existing building to the suitable scale.
4	Create a CAD model of (G+1) Framed Structure Residential Building (2BHK) with roof and staircase using AutoCAD software showing: Plan, Elevation, Sectional view through Staircase and Foundation plan.  Also take the print out of these views.

**Suggested learning resources:**

1. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd

2. Singh, Ajit, Working with Auto CAD, Mcgraw Hill Publishing company Ltd.
3. Brian C. Benton and George Omura, Mastering AutoCAD 2021 and AutoCAD LT 2021, Sybex Publication.
4. M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill
5. Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.

**E-Learning resources:**

1. <https://www.thesourcecad.com/autocad-tutorials/>
2. <https://www.youtube.com/watch?v=QuR-VKis3jU>
3. <https://www.youtube.com/watch?v=IkRwmahvibw>
4. [https://www.youtube.com/watch?v=JfHGU6M\\_Uwg](https://www.youtube.com/watch?v=JfHGU6M_Uwg)

**Practical outcomes:**

The students will be able to:-

- Work on AutoCAD software workspace conveniently.
- Operate the CAD interface by using basic drawing, editing and viewing tools.
- Prepare line plans of residential and public buildings using AutoCAD.
- Create 2D/3D- models of any structural member using AutoCAD
- Prepare working drawing using AutoCAD for the given requirement of Framed Structure.

\*\*\*\*\*

## Staad.Pro

<b>Subject Code</b> <b>2015411</b>	<b>Term Work</b>			<b>Credits</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>		
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Internal (PA)</b>	<b>:</b>	<b>50</b>
	—	—	<b>04</b>	<b>External (ESE)</b>	<b>:</b>	<b>35</b>
					<b>02</b>	

### Course Objectives:

Following are the objectives of this course:

- To learn the basic principles of Staad. Pro software.
- To understand the Staad. Pro workspace and user interface.
- To model complete plan, section and elevation of a civil engineering structure like building etc. using Staad. Pro.
- To analyses and design civil engineering structures using Staad Pro software.

## CONTENTS: TERM WORK

<b>1</b>	<ul style="list-style-type: none"> <li>• <b>Getting Started with Staad. Pro:</b> Introduction, Installing and Starting the Software, User Interface, Working with Commands, setting up configuration, Opening an Existing Project File, Menu Bar, Tool Bar, Main Window, Viewing Your project, Page set up control, Nodes, Working with X, Y and Z- axes, Saving Your Work.</li> <li>• <b>Basic Staad. Pro Commands:</b> Creating Lines, Creating Vertical and Horizontal Lines, Creating Rectangles/circles, Creating Arcs, Polygons etc., Creating Objects, delete command, deleting objects, Undo and Redo Actions, Selecting Objects for Editing, Moving Objects, Copying, Rotating, Dimensioning, Assigning geometric properties, member properties etc. Creating various types of supports.</li> <li>• <b>Creating 1D, 2D and 3D Models.</b></li> <li>• <b>Pre-processing tools and post-processing tools.</b></li> <li>• <b>Using Structure Wizard</b></li> </ul>
<b>2</b>	Analysis of a 2D frame using Staad. Pro Software.
<b>3</b>	Analysis and design of RCC Beam using Staad. Pro Software.
<b>4</b>	Analysis and design of RCC Slab using Staad. Pro Software.
<b>5</b>	Analysis and design of RCC column using Staad. Pro Software.
<b>6</b>	Analyze and design a 3D truss framed structure under certain load condition using Staad. Pro software. Follow suitable IS codes for reference.
<b>7</b>	Analyze and design a (G+3) Framed RCC Structure Residential Building using Staad. Pro software. Assume any suitable load condition as per IS codes.

### Suggested learning resources:

- Staad. Pro. V8i Technical Reference manual.
- Staad. Pro, Getting Started and Tutorials, Research Engineers International.
- T.S. Sharma, Staad Pro V8i for Beginners.
- Sham Tickoo, Learning Bentley Staad. Pro V8I for Structural Analysis, Dream Tech Press.

### E-Learning resources:



- [https://www.youtube.com/watch?v=HjXqRSpbVEk&list=PL6nIzK-h0nVW0Gr\\_DbFEwKhzoFRd4uci7](https://www.youtube.com/watch?v=HjXqRSpbVEk&list=PL6nIzK-h0nVW0Gr_DbFEwKhzoFRd4uci7)
- <https://www.youtube.com/watch?v=jzNxmzsiUOA>
- <https://www.youtube.com/watch?v=FSx09cubzZI>
- <https://www.youtube.com/watch?v=xZOSwZotucc>

**Practical outcomes:**

The students will be able to:-

- Work on Staad.Pro software workspace conveniently.
- Operate the Staad.Pro interface by using pre and post processing tools.
- Create 2D/3D- models of any structural member using Staad.Pro software.
- Model any civil engineering structure and apply various types of loads on it.
- Analyse the structure under given load conditions using Staad.Pro software.
- Design the structure according to IS codes using Staad.Pro software.

\*\*\*\*\*