

## CIVIL

### 4<sup>th</sup> semester

COURSE CODE	COURSE TITLE	TEACHING SCHEME				EXAMINATION SCHEME				
		L	T	CREDI	THEOR		PRACTIC		GRAN	
					ES	PA	ES	PA		
3340601	STRUCTURAL	3	1	2	5	70	30	20	30	150
3340602	ADVANCED SUR	3	0	6	9	70	30	60	90	250
3340603	BTE	3	0	2	5	70	30	20	30	150
3340604	WATER	3	0	2	5	70	30	20	30	150
3340605	SOIL MECHANICS	3	0	2	5	70	30	20	30	150
3340606	COMPUTER	0	0	4	4	-	-	40	60	100
TOTAL			1	16	33	350	15	180	270	950

### **Course Title: Structural Mechanics-II (Code: 3340601)**

Teaching Scheme			Evaluation Scheme			
Theory	Tutorial	Practical	Mid	Internal	University	Credits
3	0	02	30	50	70	5

#### **1. Fixed Beam**

Different types of Determinate & Indeterminate Structures & Structural Components/ Elements, Advantages of fixed beam over simply supported beam, Concept of analysis by Area Moment method,  $\mu$  and  $\mu'$  diagram, Numerical for SF & BM diagrams for fixed beam with central point load &/or UDL over Full Span

#### **2. Slope & Deflection**

Slope & Deflection, Formulae of Slope & Deflection for Cantilever Beam subjected , Point Load at free end , point load not at free end and with UDL along full Span ,Formulae of Slope & Deflection for S.S Beam subjected , Central Point Load and with UDL along full Span, Numerical problems on Slope and Deflection .

#### **3. Continuous Beam**

Statically Indeterminate Beam Like Propped Cantilever, Continuous Beam with or without Over Hang Define Free Moment & Fixed End moment diagrams Theorem of Three Moment (Clapeyron's Theorem), Formulae , find B.M of a continuous beam using theorem of Three Moment Method ,Point of Contra-flexure & its importance, Numerical , draw S.F & B.M Diagram for two or three span continuous beams having end supports as overhang , fixed and / or hinge and subjected , Central Point Load and/ or U.D.L over full span using Theorem of Three Moment , Stiffness, flexibility, carry over Factor & Distribution Factor Moment Distribution Method, Numerical , draw S.F & B.M Diagram of two or three span continuous beams having end supports as overhang , fixed and / or hinge and subjected , Central Point Load and/ or U.D.L over full span using Moment Distribution Method

#### **4. Combined Direct & Bending Stresses**

Eccentricity, Formula for combined Direct & Bending Stresses ,Limit of Eccentricity , Core of section for Rectangular & Circular ( Hollow & Solid ) ,Formulae for combined stresses on sections subjected , eccentric loads considering Uniaxial & Biaxial eccentricity, Stress distribution diagrams, Application of concept of combined stresses , find pressure at base & stability check of Retaining Wall & Rectangular & Trapezoidal Dam, Numericals.

#### **5. Principle Stresses & Principle Planes**

Formulae for Normal , Tangential & Resultant Stresses due , Direct Orthogonal Stresses & Shear Stress ,Numericals,Formulae for Principal Stresses and for Location of Principal Planes ,Numerical

**Text Book**

Theory of Structures – vol I & II S B Junarkar H J Shah Tata Mcgraw Hill Charotar Publication

**Course Title: Advanced Surveying  
(Code: 3340602)**

Teaching Scheme			Evaluation Scheme			
Theory	Tutorial	Practical	Mid	Internal	University	Credits
3	0	6	30	100	70	9

**1.Theodolite**

Introduction Classification of theodolite, Uses of theodolite, Sketch and parts of Transit Vernier theodolite, Reading of main and vernier scale on horizontal and vertical plate,Temporary adjustment of a theodolite ,Permanent Adjustment of theodolite (Fundamental axis of theodolite and their relationship) ,Definitions and technical terms, Methods of measuring horizontal angles And vertical angles, Use theodolite for measuring a magnetic bearing, prolong a line, ranging a line, Measuring direct and deflection angles, Errors in theodolite work,Theodolite Traversing, Traverse computations, Closing errors, Balancing the traverse, Gale’s Traverse Table, Related examples,

**2. Trigonometrical Levelling**

Introduction, Methods of observations (Direct and Reciprocal), Methods of determining the elevation of a particular point, - when base of the object is accessible, - when base of the object is inaccessible, related examples using all methods,

**3. Tacheometry**

Introduction, Purpose and Principles of tachometric surveying, Instruments used in Tacheometry, Theory of Stadia Tacheometry, Anallatic Lens, advantages & disadvantages. Methods of determining constants of a Tacheometer, Related examples on tacheometer constants, Methods of Tacheometry (Stadia & Tangential ),Method of Fixed Hair :- When line of sight is horizontal and staff held vertically , - When line of sight is inclined and staff held vertically (Angle of Elevation & Depression),Advantages and disadvantages of Tangential method, Related examples of Tacheometer using all methods.

**4. Curves**

Introduction, Types of circular curves, Definitions and notations, Designation of curve, Relation between Radius and degree of curve, Elements of simple circular curve, Setting out simple circular curve, Methods of setting out simple circular curves, Transition curves - Requirements and purpose of it. Vertical curves, Related examples of curves.

**5. Advanced Survey Equipments**

Introduction , Basics of Digital Theodolite, Introduction and Principles of E.D.M., Introduction and Basics of ,total station , - Parts of total station,- Advantages, disadvantages and uses of ,total Station,- Types of ,total Station,- Advancement in ,total Station Technology,- Automatic Target Recognition ATR Surveying using ,total Station,- Flow chart of data collection,- Fundamental Parameters of ,total Station, Precautions , be taken while using ,total Station, Field equipments, Set up of ,total Station , - Centering, Levelling , back-sight, Azimuth Marks , Measurement with ,total Station, ,total Station Initial Setting, Field Book recording, Radial Shooting, ,total Station Traversing, Survey Station description, Occupied Point Entries, Data Retrieval, Field Generated Graphics, Construction

layout using ,total Station, Overview of Computerized Survey Data, Equipment Maintenance, Maintaining Battery Power, total Station Job Planning and Estimating ,total Survey system errors Sources and how , avoid them Controlling errors,

**Text Book:**

1 Surveying and Levelling N. N. Basak Tata Mc Graw Hill

**Course Title: BASIC TRANSPORTATION ENGINEERING  
(Code: 3340603)**

Teaching Scheme			Evaluation Scheme			
Theory	Tutorial	Practical	Mid	Internal	University	Credits
3	0	2	30	50	70	5

**1. Introduction and Road Geometric**

Importance & Classification roads, Modes of transportation, Requirements of good roads and its advantage, Road alignment and their ty,Importance of road alignment, Fac,rs affecting the alignment, Cross section of road showing its component as per IRC, Function of each component,

Terms used in road geometry Camber, sight distance, Super elevation, Widening of Road, Transition curve and Road Gradient

**2. Road materials and its construction aspects**

Types of Pavement, Necessity of Soil Stabilization and its methods, Types of materials used in road Construction, Various tests on Aggregate and bitumen., Construction of Flexible and Rigid Pavement, Types of Failures in roads, Maintenance of roads and its Components,

**3. Drainage and Maintenance of road.**

Importance of drainage, Purpose of drainage, Methods of Surface and Sub-surface drainage, Maintenance of drainage system.

**4. Introduction and Permanent way.**

Typical cross section of various permanent ways as per IRS, Function of Various Components. Method of fixing the rails with slipper, Function of Rail joints, Railway gauge, Types of Rail gauge and uniformity of gauge , Function of point and crossing, Fac,rs affecting point and crossing, Components of Turn outs and types of crossing.,

**5. Yards and Maintenance of railway track**

Classification of Yards, Function of Various Yards., Requirement of Track Maintenance, Daily and periodical Maintenance., Maintenance of Alignment, Drainage, Track Material and its components, Point and crossing and level crossing.,

**6. Introduction, Investigation and Maintenance of Bridge.**

Importance and term used in Bridge, Component of Bridge and its function, Requirement of an ideal bridge, Classification and types of bridge, Bridge Site Characteristics, Fac,r affecting the selection of Bridge Site. Explain following terms: Scour, Afflux, Runoff, Economic Span, Clearance, Freeboard, Classification of Cause Way and its limitations. Routine and in depth inspection, Requirements of Inspection Report, Maintenance of Steel Bridge, Masonry Bridge, Cause Way, Piers, Pile bents, Abutment, Wing Wall, Road Surface, Drainage, Parapet Wall and Bearing.

**Text Book:**

1 Highway Engineering S K Khanna & Jus, Khanna publication, Delhi

**WATER RESOURCES MANAGEMENT**  
(Course Code: 3340604)

Teaching Scheme			Evaluation Scheme			
Theory	Tu,rial	Practical	Mid	Internal	University	Credits
3	0	2	30	50	70	5

**1. INTRODUCTION**

Scope of W.R.M., Necessity of W.R.M., Role of various agencies in W.R.M.: - Agriculturists - Meteorologists - Geologists - Industrialists - Scientists - Biologists - Water quality Control (Authority) - Mechanical Engg. - Electrical engg. - Economists - Social workers - NGO's - Politicians - General Public

**2. HYDROLOGY**

Define Hydrology, Hydrological cycle, Forms of precipitation, Precipitation occupancy & its types, Measurement of rain fall, Rain gauges a. Non Recording, b. Recording, - Float type, - Tipping bucket, - weighing bucket, Methods of determining average rainfall, a. Arithmetic average method, b. Thiessen polygon method, c. Isohyets method, Determine optimum no. of rain gauges for given catchment area, Runoff, Factors affecting runoff, Runoff calculation using empirical formula only, Evaporation, Transpiration & Evapo-transpiration, Factors affecting evaporation.

**3. GROUND WATER**

Sources of water, Importance of ground water and present scenario, Terms related, groundwater engineering: Aquifer, Aquiclude, Aquifuge, Aquitard, porosity, Specific yield, Specific retention, storage coefficient, coefficient of permeability, coefficient of transmissibility, Yield, specific yield, Types of well, - Open, Tube and flowing well, - concept, location and importance, Necessity of recharging, Artificial recharging as, day's need, Types of artificial recharge, - Spreading method, - Pit method / khet-talavadi, - Induced recharge method, Recharge well method, - Sub-surface dam, - Check dam series, - Ponds, - Unlined canals,

**4. SEVARAGE WORKS**

Survey and investigations, Investigations for hydrologic data, Geological data, topographic investigation, Collection of legal data, water right, Investigation of reservoir site, land acquisition, Environmental considerations, Economical data - Benefit cost ratio, Site selection for reservoir, Methods of estimating reservoir capacity, Storage zones, Reservoir loss, Reservoir sedimentation and its control, Classification of storage works, Factors for selecting type of dam, Concept of low and high dam, Component parts of gravity and earthen dam.

**5. DISTRIBUTION WORKS**

Purpose of distribution works, Component parts & sketches, Barrage, Weir, Comparison of weir and barrage, Causes of failure of weir and remedial measures, Safe exit gradient, Control of silt entry, Scouring sluices, silt excluder, silt ejector, head regulator, Classifications of canal, - Ridge and contour, Functions of each according to network, - Line diagram of network of canal. Canal Alignment, Factors influencing canal alignment, Regime & semi-regime conditions, Canal lining, - Advantages, - Types of canal lining materials, - Methods of canal lining, Regulation works, C.D. Works. -Types, functions & sketches, Outlets. - types, situation, functions & sketches, Water-logging, effects, causes & prevention,

**6. WATERSHED DEVELOPMENT**

Explain watershed concept, Characteristic of watershed, size, shape, physiographic, slope, climate, drainage, land use, vegetation, geology, hydrology, hydrogeology, socio-economics, Watershed management & people's Participation, Role of co-operative society in watershed management.

## 7. WATER HARVESTING STRUCTURES

Necessity of Rain water harvesting , Importance of Rain water harvesting , Rain water harvesting methods , - Check dams,- Nala / Gully plugging , - Percolation tank,- Khet-talawadi , Roof harvesting,- Vegetation and plantation .

**Text Book:** 1 Ground water by H.M Raghunath

### Course Title: Soil Mechanics (3340605)

Teaching Scheme			Evaluation Scheme			
Theory	Tutorial	Practical	Mid	Internal	University	Credits
3	0	2	30	50	70	5

#### Unit – I Introduction

History , List structures where soil is used as construction material, Soil-formation in Geological cycle , Name the types of failure due , soil in Civil Engineering structure, General characteristics of different types of soils , Overview of different types of soils in Gujarat / India.

#### Unit – II Index Properties & Interrelationship

Three phase diagram, State three constituents of soil, Sketch showing three phases of soil ,Assumptions in drawing a phase diagram ,Properties of soil like Density , Field density , Dry density , Saturated density, Void ratio , Porosity , Specific Gravity , Degree of saturation Moisture content , Density Index , Derive the following relations for a soil sample from fundamentals

$$e = n/n - 1, n = e/1 + e$$

$$w \times G = e \times s_r$$

$$\gamma_d = \gamma_b / 1 + w$$

$$\gamma_b = (G + e \cdot s_r) \gamma_w / (1 + e)$$

$$\gamma_{sat} = (G + e) \gamma_w / (1 + e)$$

$$\gamma_d = G \gamma_w / 1 + e$$

Numerical on 2.3

#### Unit – III Soil Classification

Classification of soil (Grain size) as per Indian Standard, State the basis of classification of soils , Three main categories of soils , Scale for classifying soil on the basis of grain size, Mechanical Analysis of soil, Distinguish between coarse grained and fine grained Soil on the basis of range of grain size and engineering properties , Designation of sieves as per I.S. code Coarse & Fine Sieve analysis , sedimentation analysis Grading Curves and different coefficients i.e. CU and CC, Clay, silt, sand and gravel as per particle size , Consistency Limits like Liquid limit , Plastic limit , Shrinkage Limit and Plasticity Index`

#### Unit – IV Compaction

Compaction and its Application, Effects of compaction on different soil properties like permeability, shear strength, soil settlements-stability of embankment, Maximum dry density and O.M.C., Typical compaction curve , Optimum moisture content (OMC) , Maximum dry density (MDD), Proctor test , Light compaction , Heavy compaction test, Light compaction test on a given soil sample , Factors affecting compaction like water content , nature of soil (fine or coarse grained) , Grading of soil , compaction energy, thickness of layer , Compaction and Consolidation , Role of O.M.C in the field , Methods of Field Compaction & various Equipment for compaction .

#### Unit – V Permeability & Seepage

Permeable and Impermeable soils , Permeability and Impermeability, Flow of water through pipe and ,Through soil , Factors affecting the permeability, The factors affecting permeability of soil , Factors used , control the permeability of soil , desired extent in various Civil engineering structures , Methods , find Coefficient of Permeability Constant Head Method , Falling Head Method, Coefficient of permeability, Numerical based on

$$K = (Q \times L) / (t \times h \times A)$$

$$K = (2.3 \times a \times L) / (A \times t) \log_{10} h_1/h_2$$

Seepage pressure, Quick sand condition, Flow net, its characteristics and application.

#### Unit-VI Shear Strength

Definition, Define: (a) Cohesion (b) internal friction (c) Shear strength, Coulomb's law for shear strength  $S = C + \sigma_n \tan \phi$ , Shear strength of soil, Different shear tests used, determine shear strength of soil in laboratory, Procedure of direct shear test (Box shear test), Types of soil C-soil,  $\phi$ -soil, C- $\phi$  soil. Draw failure envelope by drawing Mohr's circle from the data obtained during direct shear test, Calculate the values C and  $\phi$  from the failure envelope of direct shear test.

#### Unit-VII Bearing Capacity of soil

Bearing capacity of soil, Net Bearing capacity, Safe Bearing Capacity, Ultimate Bearing Capacity, Bearing Capacity of various soil, Methods – Plate Load Test, Penetration Test & using C –  $\Phi$  parameters for determining bearing capacity of soil and, improve bearing Capacity of soil, Foundation on soils of various bearing Capacity, Liquefaction Definition, Mechanism

#### Unit-VIII -Soil Investigation & Exploration

Objectives of exploration of Soil, Planning of exploration program and soil samples, Field penetration Test : SPT, Introduction, geophysical methods.

#### Text Book:

1 Soil mechanics and foundation engineering by Dr. B.C.Punamia

### Course Title: Computer Aided Drawing (Code: 3340606)

Teaching Scheme			Evaluation Scheme			
Theory	Tutorial	Practical	Mid	Internal	University	Credits
4	0	2	30	50	70	6

#### Unit – I Introduction, Auto cad

File menu of AutoCAD with New, Open, Save, Save AS and Close, Basic 2D Draw commands like Line, Circle, Ellipse, Multi Line, Construction Line, Polyline, Point, Donut, Ellipse, Polygon, Rectangle, Arc, Erase, Snap, Redraw, Regenerate, Zoom, Pan.

#### Unit – II Editing of AutoCAD Drawing

Modify Properties of Drawing Entity, Copy, Move, Rotate, Mirror, Offset, Array, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer, Fillet, Block, WBlock, Insert and Explode, Area and Volume with Civil Engineering Application.

#### Unit – III Advanced 2D Commands

Application of LAYER command in Civil Engineering, Layer command with its all sub commands, Line type, Color, Dimension command – linear, aligned, arc length, radius, Diameter, Centre, Leader Baseline and Continuous Dimensioning, lolerance, override and Dimension updates, Text and DTEXT commands with Text Style, Hatch command

#### Unit – IV 3D Commands of AutoCAD

Units, Elevation, Thickness, UCS and UCS Icon, Viewports, Extrude, 3D Solids – Sphere, Box, Cylinder, Cone, Wedge, Interference 3D Surface – Revolved, Tabulated and Ruled Surfaces, Hide, Render and Shade of 3D drawings

#### Unit – V Plot of 2D & 3D Drawings

PLAN, ELEVATION and 3D Views of Residential Building and Commercial Building, PLOT and its Sub Command for Plotting, Drawing on A1, A2 and A3 Size Paper using Printer and / or Plotter