Jharkhand University of Technology
Ranchi, 834010

SYLLABUS

For Diploma Program in

Civil Engineering

(Effective from 2024-25)

DEPARTMENT OF CIVIL ENGINEERING

(3rd – SEMESTER)

Engineering Mechanics and Strength of Materials

Subject code – CIV301

1 Rationale: The study of strength of materials often refers to various methods of calculating the stresses and strains in structural members such as beams, columns and shafts. The methods employed to predict the response of a structure under loading and its susceptibility to various failure modes takes into account the properties of the materials such as its yield strength, ultimate strength, Young's modulus, and Poisson's ratio. In addition, the mechanical elements, geometric properties such as its length, width, thickness, boundary constraints and abrupt changes in geometry such as holes are considered.

2 Course Outcomes/Skill Sets: At the end of this course students will be able to:

CO-01	Explain the potential impact of forces / stresses on structural elements / materials in a givencondition.
CO-02	Calculate the moment of Inertia for a given symmetrical or asymmetrical geometric sections.
CO-03	Calculate shear force and bending moments for different loading conditions and supportconditions, draw the SFD &BMD and validate the analysis using Ansys software.
CO-04	Calculate bending and shear stresses in beams under different load conditions and validatethe analysis using any FEM analysis software.
CO-OS	Calculate and validate the safety of a column for various given loads and end conditions.

3. Course Content

Week	CO	PO	Lecture (Knowledge Criteria)	Tutorial (Activity Criteria)	Practice (Performance Criteria)
			3 hours/week	1 hour/week	4 hours/week(2 hours/batch twicein a week)
1	1	1, 2	1.Force and characteristics of aforce. Force system: Classification of force system according to plane		1 &2. Verification of lami's Theorem.

			and line of action- Principle of transmissibility of forces, moment of a force, Resolution & composition of forces.	1.Determine Forces in members of a truss at the given joint. 2.Determination of resultant of forces acting on retaining wall and trapezoidal dam section.	
			2. Resultant force, Law of moments, Resultant of Concurrent and non-concurrent force system. Equilibrium conditions.		
			3.Simple Problems on determination of resultant of con current & non concurrent force systems.		
2	1	1, 2	1.Rigid body, plastic body Mechanical properties of metal- Rigidity, Elasticity, Plasticity.	1. Compare the properties of Hard, soft, brittle and Ductile material.	1. Hardness test to evaluate a hardness of given material Example: Mild Steel, Stainless steel, Wood, Copper, Bronze, Brass, Aluminium, Glass.
			2.Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility		2. Impact test to evaluate toughness of a given material Example: Mild Steel, Stainless steel, Wood, Copper, Bronze, Brass, Aluminium, Glass.
			3. Malleability, Creep, Fatigue, tenacity, durability. Testing procedures and importance of each property of materials.		
3	1	1, 2	1. Stress, strain, Hooke's law Types of stresses - Normal stress and Shear stress Types of normal stress - Tensile stress and Compressive stress	1. Plot Stress/strain graph for various structural steel	1.Conduct tensile test on following materials and plot Stress-strain curve a) Mild steel b) HYSD bar Determine yield stress/ proof stress, Ultimate stress, breaking stress and percentage of elongation, Young's Modulus
			2.Types of strains- Normal strain and Shear strain Types of normal strain - Longitudinal strain, Lateral strain and volumetric strain Types of Lateral strain - Tensile strain and Compressive strain		2.Conduct tensile test on following materials and plot Stress-strain curve a) Plastic b) Bamboo c) Fibres Determine yield stress/ proof stress, Ultimate stress, breaking stress and percentage of elongation, Young's Modulus
			3.Problems		

4	1	1, 2	1.Elongation and Contraction - Poisson's Ratio and Modulus of Elasticity. 2.Problems 3.Problems	1. Determine Stresses and Modulus of Elasticity in Civil Engineering Building materials	1. Conduct tensile test and Measure strain using electric strain gauge on following materials and plot Stress-straincurve. a) Mild steel b) HYSD bar 2. Determine yield stress/ proofstress, Ultimate stress, breakingstress and percentage of elongation, Young's Modulus and compare the methods of finding yield stress.
5	1	1,2	1. Stresses in bars of compositesection (Modular ratio). 2. Principles of superposition, Deformation of uniform barsand bars of varying cross section subjected to constantload &varying loads. 3. Volumetric strain & change in volume, Relation among elastic constants, Thermal stresses.	1. Analyse the thermal stressesin different materials using Open-source Software.	1. Problems on axially loaded composite sections. 2. Analysis of Composite Section -Interpretation of Results. (Analysis by any FEM analysis software)
6	2	1, 2,3	1 Centre of gravity & centroid, Moment oflnertia forPlane lamina: radius of gyration, elastic sectional modulus, parallel and perpendicular axes theorems 2. Moment ofInertia for rectangle, square, circle, semi-circle, and quarter circle and triangle section. 3. MI of symmetrical and unsymmetrical I section, Channel section.	1. Study and compare different geometrical shapes of structural elements like beams, columns,members of truss, shafts etc.	1. Calculation of Centroid and Moment ofInertia of different sections using CADD software. 2. Finding the centroid and moment of inertia of irregular sections by manual method (Open ended Experiment) Comparison of MI with manualcalculation and CADD software.
7	2	1, 2,3	1. MI of T section, L section, hollow sections, built-up sections about centroidal axesand any other reference axis 2.Problems.	1. Calculation of Moment of Inertia for otherbuilt-up sections.	1 &2. Calculation of centroid and Moment ofInertia by Open- Source application/Ansys for agiven section andInfluence of MI on a strength of section

			3.Polar moment of inertia ofsolid circular sections. - problems. 1. Types of beams -simply supported, cantilever, fixed continuous and overhangingbeams.		
8	3	1, 2,3	Types of supports: Roller support, Hinged support, Fixed support and Pinned support. 2. Determinate structures: Types of loading- Axial load, Transverse load, point load, uniformly distributed load, uniform varying load, moment, support reactions for determinate structures. 3. Concept of shear force and bending moment, sign convention. Relation betweenbending moment, shear force and rate of loading. 1. Calculation of Bending Moment and shear force for cantilever beams with UDL andpoint load and Draw Shear force and bending moment diagrams for cantilever beams with UDL andpoint load. 2. Problems.	1. Differentiate between line, Surface and solid structural elements on thebasis of their behaviour under loads. 1. Calculation of Bending Moment and shear force for for fixed beams with UDL and point load. 2. Draw Shear force and bending moment diagrams for fixed beam beams. (UDL and point load).	1. Calculation of Bending Moment and shear force for simply supported beams withUDL and point load. 2. Draw Shear force and bending moment diagrams for simply supported beams. (UDL and point load). 1. Analyse simply supported beams, subjected to different types of loads, for SFD and BMDusing any FEM analysis software.
9	3	1, 2,3	3. Problems. 1. Calculation of Bending Moment and shear force for overhanging beams with UDLand point load Draw Shear force and bending	1. Calculation of bending moment and	2. Analyse cantilever beams, subjected to different types ofloads, for SFD and BMD using any FEM analysis software.
10	3	1, 2,3	moment diagrams for overhanging beams with UDL load and Locate points of contra- flexure. 2. Problems.	shear force foe an overhanging and point beam of bicycle stand.	1& 2. Analyse overhanging beams, subjected to different types of loads, for SFD and BMD using any FEM analysissoftware.

			3. Problems		
11	**4**	**1,** 2,3	1. Bending stress in beam, Assumptions in simple bendingtheory, bending equations. 2. Neutral axis, Modulus of rupture, section modulus, flexural rigidity, moment ofresistance. 3. Bending and Shear Stressesacross the cross section of thebeams- rectangular and T section.	1. Determine bending stress and shear stressacross a section of structural elements like RCC beam, Steel beam and purlins.	1. Problems on Bending stressand preparation of bending stress distribution diagram- variation of bending. 2. Flexure Test on materials like steel, concrete specimens -Two Point Load system.
12	5	**1,** 2,3	1. Slope and deflection using Moment area method for simply supported and cantilever beams subjected tosymmetrical point loads and UDL. 2. Problems 3. Problems	1. Calculation of deflection for Overhanging beams 2. Limitation of deflection for various structural Elements	1. Calculation and analysis of beams for slope and deflectionby Open-Source application / any FEM analysis software 2. Animations of deflection
13	5	**1,** 2,3	1. Introduction - Short and longcolumns - Euler's theory 2. Effective length, slendernessratio - radius of gyration, buckling load, crippling load 3. Assumptions, Euler's Buckling load for different endconditions, Limitations of Euler's theory	1.Study and prepare a reporton the failure modes of Column and Influence of L/Dratio on the Strength of column.	1. Problems 2. Calculation and analysis of crippling load by Open-Source application/any FEM analysis software for Axial load, eccentric load and column withdiffierent materials
Total in hours			**39**	**13**	**52**

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, videodemonstrations and field visits.

NOTE 2: The TUTORIAL (Activity criteria) shall be conducted / executed by the student (Minimum ONEsuggested activity from each week) and to be submitted in portfolio evaluation of activities through rubrics

to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and reportto be submitted at the end of each session to the faculty.

4. Reference:

Sl. No.	Description
1	**Ramamurtham. S.,** ***"Strength of Materials",*** 14th Edition, DhanpatRai Publications
2	**SS Bhavikatti, Strength of Materials**
3	Fundamentals of strength of materials by **P N Chandramouli"** PHI New delhi
4	Relevant IS Codes

Modern Surveying

Subject code – CIV302

Week	CO	PO	Lecture (Knowledge Criteria)	Tutorial (Activity Criteria)	Practice (Performance Criteria)
			Hours/week	Hour/week	Hours/week
1.			1. Contours, Importance of contour maps. Characteristics of contours. 2. Methods of plotting contours. Factors affecting contour interval. 3. Method of preparing contour map from the given RLs of grid points with examples.	1. Study the contour maps of different topography. 2 Study the Uses of Contours in civil engineering field 3 Measure the volume of Reservoir from contour maps.	1. Conduct block contouring for a minimum area of 40 m x 40 m to draw its contour plan at a suitable contour interval. 2. Find out the area enclosed by the contours using AutoCAD.
2	1	1,2, 4,7	1. Component parts of transit theodolite and their functions. 2. Reading the vernier, Salient features and relationship between the fundamental axes of transit theodolite. 3. Technical terms used. Temporary adjustments.	1. List the Applications of different types of theodolites.	1. Measure horizontal angle between the given points. 2. Measure vertical angle between the given points.
3	1	1,2, 4,7	1. Theodolite traversing. Open and Closed Traverse. 2. Theodolite traversing by included angle method and deflection angle method. 3. Checks for open and closed traverse, Calculation of bearing from angles. Traverse computation-Latitude, Departure.	1. Study the Consecutive coordinates, independent coordinates. 2. Balance the traverse using spreadsheet by Bowditch rule or Transit rule. 3.Conduct Contouring using Theodolite.	1.Measure horizontal angle by repetition and reiteration method. 2. Carry out survey project for closed traverse for minimum 5 sides by locating details using theodolite.

4	2	1,2, 4,7	1. Trigonometrical Survey and its applications. 2. Elevations and Distances of accessible points whose base is accessible-Single plane method-Simple problems. 3. Elevations and Distances of inaccessible points whose base is inaccessible-Single plane method-Simple problems.	1. How do we measure heights of mountains? 2.Measure height of inaccessible high-rise towers.	1. Measure height of an object whose base is accessible. 2. Measure height of an object whose base is inaccessible.
5	2	1,2, 4,7	1. Tachometer: Principle of tachometry and component parts. Analytic lens 2. Tachometric formula for horizontal distance with telescope horizontal and staff vertical. 3. Method of determining Horizontal and vertical distances with tachometerby fixed hair method and staff held vertical.	1. List the applications of Tachometric survey. 2. List the limitations of tachometry.	1. Determine Tachometric constants. 2. Calculate the reduced levels and horizontal distances of given points using tachometer.
6	3	1,2, 4,7	1. Total Station: Introduction, Integral parts, Applications. 2. Working principle, Advantages, Disadvantages. 3. Use of function keys. Precautions to be taken while using a Total Station.	1. List the Applications of different types of Total Stations. 2.Differentiate between theodolite and Total station.	1. Component parts and General commands used. 2. Instrument preparation and setting up.
7	3	1,2, 4,7	1. Setting up a back sight. Azimuth mark, control point. Change point - procedure to shift change point and precautions to be taken. General settings. 2. Automatic Target Recognition, Field Book recording, Radial Shoot. 3. Survey Station Description (codes). Occupied point (Instrument Station) Entries.	1. Calculate Height using Trigonometric survey and compare results with total station.	1. Find out the Horizontal angle, Vertical angle of given points. 2. Find out the distance, gradient and differencein height between two inaccessible points using Total Station.
			1. 3D coordinates: By Resection.		

8	3	1,2, 4,7	Coordinate calculation. Offset: Single distance offset. 2. Date Retrieval, Field Generated Graphics. Data Gathering Components, Data Processing Components of the system. 3. Data plotting, Field computers, Modem for data transfer.	1. Compare and prepare report on accuracy of results between Theodolite and Total Station.	1. Stake out using Total Station- Find a specific point and its coordinates in the field. 2. Find out the height ofa remote point like tip of a transmission toweror chimney using Total Station.
9	3	1,2, 4,7	1. Interfacing the Data Collector with a Computer, Digital Data.	1. Compare and prepare a report on time requirements	1& 2: Prepare a topographic sketch of a given area using Total station and plot the

			2. Digital transfer of data to Application software. Requirements of a data collector. 3.Calibrating the Instrument Equipment maintenance, Maintaining battery power.	to complete a particular activity by Total Station with other equipment.	contour plan using AutoCAD / Civil 3D/ Auto plotter.
10	3	1,2, 4,7	1. Total station survey system error sources and how to avoid them. 2& 3. Controlling errors.	1. How Data is transferred from Total Station to other electronic devices. 2.Collect the survey sketch of any place and mark the boundaries and determine the area using total station	1. Conduct a closed traverse for a given area using Total Station. (Including minimum two change points) 2. Plot the area map of the closed traverse conducted using AutoCAD and Find the area.
11	4	1,2, 4,7	Construction Layout Using Total Station 1. How to set control points around the layout site. 2. How control points and coordinates are used to set out the position of buildings (how the positions of the actual structures are fixed and site profiles to guide the excavation and pouring concrete into the foundations) 3. Setting up site profiles and sight rails for Drainage.	List the points that should be kept in mind while using Total station during the operation of a. Levelling b. Measuring distances c. Measuring angles. d. Contouring	1. Set out control points for centre line marking of a building using the total station. 2. Set out control points for laying of pipeline using total station.
12	4	1,2, 4,7	1. Aerial Surveying, GPS: Introduction, Applications. Positioning methods, Errors and Limitations in GPS. applications of Google maps in civil Engineering. 2. Remote Sensing: Introduction, Basic components of remote sensing, energy interaction with the earth surfaces.	1. How the Remote sensing Interpretation is done? 2. Study the classification, applications, advantages & Disadvantages	Virtual Media and Field Visit

			3. Applications of remote sensing in mining, land use/land cover, mapping, disaster management and environment.	of GPS surveying 3. Prepare a Technical Report on Field Visit.	
13	4	1,2, 4,7	1. GIS: Overview, components Applications and Limitations. 2. Drone Surveying: Overview, Applications and Limitations. 3. Lidar: Overview, Applications and Advantages. Hyper spectral Imagery.	1. What is the need of GIS for civil engineers? 2. Prepare a Technical Report on Field Visit.	Virtual Media and Field Visit
Total in hours			**39**	**13**	**52**

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits.

NOTE 2: The TUTORIAL (Activity criteria) shall be conducted / executed by the student (Minimum ONE suggested activity from each week) and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty.

4. Reference:

Sl. No.	Description
1	**Duggal, S. K., Surveying Vol. I & II,** Tata Mcgraw Hill, New Delhi
2	**Subramanian, R., Surveying & Levelling,** Oxford University Press, New Delhi
3	**Punamia, B.C., Surveying Vol. I, II & III,** Laxmi Publications
4	**Kanetkar, T.P. and Kulkarni, S.V., Surveying and Levelling Vol. I & II,** Pune Vidyarthi Gruh
5	**Arora, K.R., Surveying Vol. I, II & III,** Standard Book House. New Delhi
6	**Basak, N.N., Surveying and Levelling,** Tata Mcgraw Hill, New Delhi
7	**A. Bannister, S. Raymond, R. Baker, "Surveying",** Pearson, 7th ed., NewDelhi
8	**Agor, R., Surveying and Levelling,** Khanna Publishers, New Delhi
9	**Agor, R. Advanced Surveying**, Khanna Publishers, New Delhi

10	**Roy, S.K., Fundamentals of Surveying,** Prentice Hall India, New Delhi
11	**Remote Sensing and GIS by B Bhatia,** Oxford University Press, New Delhi.
12	**Remote sensing and Image interpretation by T.M Lillesand, R.W Kiefer and J.W Chipman,** 5th edition, John Wiley and Sons India
13	**Lo, C.P. & Yeung A.K.W., Concepts and Techniques of Geographic Information Systems,** Prentice Hall of India, New Delhi, 2002
14	**Anji Reddy, M., Remote Sensing and Geographical Information Systems,** B.S.Publications, Hyderabad, 2001

Construction Techniques

Subject code – CIV303

Week	CO	PO	Lecture (Knowledge Criteria)	Tutorial (Activity Criteria)	Practice (Performance Criteria)
			Hours/week	**Hour/week**	**Hours/week**
1			1. Climate factors: Tropical climate, solar & wind flow pattern, Time lag & decrement factor, Periodic heat flow. 2. Classification of soils and their suitability for the construction of different structures. Bearing capacity ofsoil, Safe bearing capacity of soil. 3. Determination of Bearing capacity by Standard penetration test (SPT), Methodof improving the safe bearing capacity	1. Study the standard Penetration test and Plate loadtest. 2. Study and prepare a report on local rainfall data and type of soil strata available.	1. Field Identification of type of soil based on visualization and validate the type of soil by conducting sieve analysis test - Particle size distribution using semi-log graph. 2.Test on soil: a) Liquid limit b) Plastic limit c) Shrinkage limit.
2	2	2,4,7	1. Site clearance, Process of general & deep excavation, Necessity of shoring, Soil nailing and strutting in foundation, excavation and process of dewatering, purpose of anti-termite treatment, typeof chemical used & laying method. 2. Foundation: Purpose and classificationof foundation. Shallow foundation: Isolated footing Spread footing, combined footing, Strap footing and Raft foundation. 3. Deep foundation: Pile foundation and its types and Caisson foundation. Selection of foundation for different types of structures.	1.List the tools and equipments used for site clearance and excavation work 2.Study and prepare a report on advanced techniques in laying foundation.	1 Tests on Moisture content of soil (Oven drying method and Field density of soil by core cutter and rapid moisture meter. 2. Conduct Standard Proctor test on soil compaction.

3	2	1,2,4,7	1. Foundation in Black Cotton Soil. Causes for failure of foundation and preventive measures. 2. Plinth beam or Plinth slab / grade beams. Superstructure-Column, Beams and their suitability for different structures. 3. Load bearing walls, non-load bearing walls & framed structure. Main attributesof masonry work, Technique used in masonry work.	1.Study the construction methodology of basement and Retaining wall. 2.Study & prepare a report on Advanced techniques in masonry work.	1. Free swell Index of Black cotton soil. 2. Water Absorption test & other field test on brick. 3. Compression test on bricks, Dimensionality tolerance test.
4	3	2,4,7	1 & 2. Types of masonry work and their suitability. Stone masonry, Brick masonry, Concrete Block masonry and their types.	1.Study & prepare a report on various Precast concrete partitionwalls. 2.Prepare a report on Autoclave	1. Construction of English bond & Flemish bond, also prepare a masonry checklist for

			3. Partition walls and its types based on materials. Dry wall construction Structural Glazing, Aluminium Panelling, Infill walls and Envelopes.	brick masonry, Stabilized mud block masonry, Poro Thermo Block masonry. Laterite brick masonry.	before & after construction. 2. Construct concrete block masonry wall of height 1metre.
5	3	1,2,3 ,7	1. Ventilation requirements for health mechanisms, natural ventilation, cross ventilation and artificial ventilation, Airflow patterns in building. Purpose of providing doors, windows and ventilators and its suitability. 2.Lintels, sunshades, sun breakers and canopy, portico and their suitability. 3.Arch-Terms used, Types of arches-Flat, Segmental, and Semi-circular and their suitability.	1. Study & present the Standard size of doors, windows & ventilators for different types of building as per I.S codes.	1.Study and present important types of doors, windows and ventilators in general use. 2. Prepare process manual for installation of doors, windows and ventilators.
6	3	1,2,3 ,7	1. Stairs: Technical terms, Requirements of a stair, Indian Standards for dimensions of stairs, Construction method of staircase and its headroom. 2.Elevators: Lift pit - Foundation for Lift and concrete or Block work with intermediate column beam structure around the lift and lift headroom 3.Ramps and escalators and their importance as per Indian Standards	1. Study the Suitability of staircases, ramps, elevators and escalators in different typologies of buildings	1. Study & present different types of stairs 2.Prepare process manuals for construction of staircases, ramps and lift pit.
7	3	1,3	1.Introduction to Formwork, shuttering, centring, staging, scaffolding and its applications. 2. Scaffolding: Component parts, types of scaffolding and props, Materials used for scaffoldings. 3. Types of shoring-Raking, Flying & Dead shores. Safety precautions while using scaffolding.	1. Visit the construction site and collect details of the advanced types of scaffoldings and prepare a report.	1.Prepare a checklist (before, during after the work) & process manual for different types of scaffolding. 2. Draw different types of scaffolding using BIM software (3D using

					AutoCAD, Revit, Sketch etc.)
8	3	2,3,7	1.Formwork: Purpose of providing formwork. Types of formworks based on material. 2. Requirements and Codal provisions for Standard formwork. Monolithic Construction Formwork. 3. Method of shuttering and centring & removal of formwork. Formwork Failures and Remedies.	1. Visit construction site and prepare a photo gallery of different formworks adopted for various construction activities.	1. Study and present the tools and components used for formwork. 2. Prepare a checklist & process manual for different types of form work.
9	3	1,2,5,7	1.Roof: Types of roofs, common types of Roofing materials. 2. Pitched roof, its basic components and its suitability. Flat roof-advantages and disadvantages 3. Weather proof course for flat roofs. False ceiling and its suitability.	1. Study & compare different types of roofs considering typology of building and atmospheric conditions.	1. Prepare a checklist & process manual for construction of different types of roofs & trusses. 2.Study and present the technique of laying different types of roofs & trusses.
10	3	1,2,4,7	1. Objectives of plastering and requirements of good plaster. Method of cement plastering, 2. Types of plaster and surface finishes- Smooth, sand faced, rough cast, pebble dash, debtor, scrapped, textured finish. 3. Pointing- Method of pointing & types. Fixing of doors and windows using different fixtures.	1. Study & present advanced plastering and surface finishing techniques and its suitability.	1. Visit a construction site during Plastering Activity-Prepare check list & process manual for cement plastering.

					2. Prepare checklist & process manual for Gypsum/ POP plastering.
11	3	1,2,5 ,7	1. Definition and causes of dampness. Effects of dampness and prevention of dampness. Materials used for the damp proof course. 2. Method of Terrace waterproofing, Water tank waterproofing Methods & types of expansion jointtreatment. Roof slab leakages or dampness and arresting it. 3. Waterproofing technique for swimming pools, sump, podium, bathroom sunken slabs, water closets, retaining wall.	1.Study on advanced waterproofing techniques and grouting techniques. 2.Study and Collect working procedure for pressure grouting application for roof slab leakage or dampness	1. Prepare checklist & process manual for Waterproofing and laying procedure for different areas of building. 2.Types & laying procedure of grouts.
12	3	1,2,5 ,7	1.Types of floors, Suitability of flooring material, Process of laying Cement concrete floorings. 2. Process of laying Oxide flooring. Ceramic tile flooring, Vitrified flooring, granite flooring, Marble flooring. 3. Wooden flooring, Vinyl flooring, Vacuum dewatered flooring, IPF flooring, epoxy flooring, False flooring. Cladding Work and its types, Importance and suitability of cladding work	1. Collect samples and prepare a report on the grouting process for flooring works. 2. Study on advanced techniques in flooring. 3.Collect & present different types of flooring materials.	1.Prepare checklist & process manual for different types of flooring. 2.Prepare checklist & process manual for different types of claddingwork.
13	4	2,3,5 ,7	1. Methods of painting, Types of paints distempering & varnishing on different surfaces. VOC paints & its importance. 2. Introduction, Cause of deterioration of concrete structures, Diagnostic methods & analysis, preliminary investigations, experimental investigations using NDT. 3.Techniques for Repair:(Corrosion) Rust eliminators and polymer coating for rebar during repair, foamed concrete,	1.Study & present advanced technique in painting. 2.Prepare a report on method of application of external texture painting works.	1. Visit a construction site during Painting activity, Prepare check list & process manual for painting on different surfaces (Any one method)

			mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning.		2. Site visit, investigate the problem using NDT, analyse, adopt suitable method of repair & prepare check list & process manual for repair work.
Total in hours			**39**	**13**	**52**

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits.

NOTE 2: The TUTORIAL (Activity criteria) shall be conducted / executed by the student (Minimum ONE suggested activity from each week) and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty.

4. Reference:

Sl. No.	Description
1	Koenigsberger, O.H. et al**, "Manual of Tropical Housing and Building Part-I ClimaticDesign**", Orient Longman. 1973
2	Hvorslev MJ, "**Subsurface Exploration and Sampling of Soils for Civil Engg. Purposes**" Elsevier Pub. Co,
3	Manfredd RH, "**Engineering Principles of Ground Modification"**, McGraw Hill
4	Purushotham Raj, "**Ground Improvement Techniques**".
5	Bureau of Indian Standards, "**HandBook of Functional Requirements of Buildings, (Sp-41&Sp-32)**", BIS 1987 and 1989.
6	B C Punmia, "**Building Construction**", Laxmi Publications
7	www.nptel.ac.in

Building Drawing using CAD

Subject code – CIV304

1	1	1,4, 5,7	1.Building Bye Laws: Introduction, objects, Importance and Important terms used in building bye laws 2.Function of Local Authority, Responsibility of owner, Applicability and Principles underlying building bye laws, Setbacks or building line, light plane, Floor Space Index 3.Building bye laws to be practiced: Off street Parking, Fire Protection, Minimum Plot sizes, Thickness of walls, Plinth, Cellar, Height of floors, Stairs, Lifts, Lobbies and Corridors, Sanitary accommodation	1.Study and compare the building bye laws for different typologies of buildings and location of building	1.Symbols and sign conventions used in building drawings as per IS standards 2.Introduction to basic BIM softwares like AutoCAD, ARCHICAD, REVIT ARCHITECTURE, 3DSMAX, SKETCHUP
2	1	1,4, 5,7	1.Building bye laws to be practiced: Fenestration, Ventilation, Sills of openings, Staircases, Ramps, Roofs, Parapets and Terraces, Water tank, Refuse area/ Disposal of Solid waste, Discharge of Rainwater, Provision of Letter box. 2. Margin and Maximum Built up area, Plinth areas, for different types of buildings, Permissible Built-up area in margins, Projections in margins, Margins from Common plot, Open spaces, floor area ratio, carpet area key plan (layout plan), Site plan, building plan, working plan. 3. Building Planning- Factors, Shape, size and topography of site, Climatic conditions of the site, Safety precautions to be followed at site during building construction as per National Building Code (NBC).	1.Practice drawing of Site plan with setbacks and orientations for different dimensions. 2.Study the elements of Sustainable Planning as per NBC 2016.	1.Drawing of site plan showing setbacks for residential building using CADD software. 2.Mark the site plan on the field giving setbacks.
3	2	1,4, 7	Given the floor area or carpet areas of rooms, plan the building and draw a Single line diagram of the building. 1. Residential building 2. Commercial Buildings 3. Industrial Building.	1.Prepare Manual Drawing of Single line diagrams for different typology of buildings. Considering building bye laws	1.Execute the single line diagram using CADD software. 2.Mark the single line diagram and foundation layout for load bearing and Framed structures on the field using centre line marking method.
4	2	1,4, 7	1. Given the floor area or carpet areas of rooms, plan the building and draw a Single line diagram of the building. 1. Residential building 2. Commercial Buildings 3. Industrial Building	1.Prepare Manual Drawing of Single line diagrams for different typology of buildings	1.Execute the single line diagram using CADD software. 2.Mark the single line diagram and footing layout for load bearing and Framed structures

				considering building bye laws.	on the field using centre line marking method.
5	2	1,4,7	Draw the following views for Residential buildings 1. Plan 2. Elevation 3. Section	1.Create 3-D model of residential buildings using software's like ARCHICAD, REVIT ARCHITECTURE, SKETCH UP,3DS MAX	1.Execute the building drawing (Plan, Elevation and section) using CADD software for residential building 2.Preparation of Footing layout and Centre line/ grid line marking of residential building on the field
6	2	1,4,7	Draw the following views for Commercial Buildings 1. Plan 2. Elevation 3. Section	1.Create 3-D model of commercial buildings using software's like ARCHICAD, REVIT ARCHITECTURE, SKETCH UP,3DS MAX.	1.Execute the building drawing (Plan, Elevation and section) using CADD software for commercial building. 2.Preparation of Footing layout and Centre line/ grid line marking of commercial building on the field.
7	2	1,4,7	Draw the following views for Industrial Building having pitched roof. 1. Plan 2. Elevation 3. Section	1.Create 3-D model of industrial buildings using software's like ARCHICAD, REVIT ARCHITECTURE, SKETCH UP,3DS MAX.	1. Execute the building drawing (Plan, Elevation and section) using CADD software for industrial building 2.Preparation of Footing layout and Centre line/ grid line of industrial building on the field
8	3	1,4,7	1. Introduction to plumbing: Pipe Materials used in building construction works for water supply work - Plastic Pipes, High Density Polyethylene Pipes, Densified cast iron pipes, GI pipes, Stoneware pipes, Asbestos Cement pipes, and Concrete pipes, Hot water pipes with insulation. 2.Water supply fittings, their description and uses, water main, service pipes, supply pipe,	1.Conduct Market analysis on water supply fittings, fixtures, accessories, tools and equipment	1. Signs, Symbols and conventions of Water supply fittings and fixtures used for building servicedrawing. 2. Demonstrate the water supply fittings,

			distribution pipe, domestic storage tank, stop cock, ferrule, gooseneck, water tap, aerators, water meter. 3. Merits and Demerits. Connections from water main to buildings. Factors affecting the suitability of plumbing material and accessories for Water supply work, Water pressure test for leakage during installation of pipes.	and prepare report.	fixtures, accessories, tools and equipment.
9	3	1,4, 7	1. Importance of Sanitary work for building. Different types of Sanitary pipes and pipe materials used in building construction works for drainage and waste disposal. 2. Sanitary Fittings- Water Closets, Flushing Cisterns, Urinals, Inspection Chambers, Traps, Anti-syphonage. Connections from building to sewer main. 3. Inspection, Testing and Maintenance of sanitary line in building. Factors affecting the suitability of sanitary material and accessories for Sanitary work.	1.Conduct Market analysis on Sanitary fittings, fixtures, accessories, tools and equipment and presenta report.	1.Signs, symbols and conventions of Sanitary fittings and fixtures in building service drawing. 2.Demonstrate the Sanitary fittings, fixtures, accessories, tools and equipment.
10	3,4	1,4, 7	1.Wiring accessories: SP (single pole switch), DP (double pole switch), ICDP (Iron Clad Double Pole main switch), ICTP (Iron Clad Triple Pole switch), change over switch, modular switches, 2 pin socket ,3 pin socket, 2pin plug top, 3 pin plug top, ceiling rose, roundblock, switch boards, switch plates, modular switch enclosures, blank insert gang box, junction box, fan box. 2. Safety devices: Types of fuse units and Materials for fuse wire, Glass cartridge fuse, types of HRC fuse, Kit kat fuse. Types of MCB,MCCB, RCCB, ELCB Types of Earthing- Pipe earthing, Plate earthing, Lightning arrestors. 3.Types of wiring systems and their applications: Surface conduit, concealed conduit, PVC casing capping. Types of wires, cables used for different current and voltage rating, Connection from Electric source to building based on electricity load.	1.Conduct Market analysis on Electrical wiring, fittings, fixtures, accessories, tools and equipment and presenta report. 2.Study on energy saving using Solar Panel installations with accessories in buildings.	1. Signs, symbols and conventions of Electrical wiring, fittings and fixtures in building service drawing. 2.Conduct field visit to study plumbing and electrical installations in ongoing building constructions.
11	3,4	1,4, 7	Building Basic Services 1. Preparation of water supply Layout for residential building. 2. Preparation of Sanitary Layout for residential building.	1.Prepare basic service layouts like Water	1&2. Prepare basic service layouts like Water supply, Sanitary, Electrical layouts for

			3. Preparation of Electrical Layout for residential building.	supply, Sanitary, Electrical layout for your college building using any Application software and demonstrat e.	residential building using AUTOCAD withlayers.
1 2	3,4	1,4, 7	1 Fire classifications, Importance of providing Fire fighting system and fire safety requirements in Commercial and Industrial Building. 2.Components of the fire fighting system andits applications in Commercial and Industrial Building. 3. Location of fire fighting system, installations and Code of Practice for fire safety in different typologies of Buildings. Fire ratings.	1.Conduct Field visit and study the firefighting system installations , fire safety measures and demonstrat e.	1 & 2 Prepare basic service layouts like Water supply, Sanitary, Electrical and Fire fighting system layouts for Multi-storeyed building using AUTOCAD using layers.
1 3	3,4	1,4, 7	1. Importance of conservation of rain water by Rain water harvesting unit in buildings. Components of the rainwater harvesting system. 2.Methods of Rainwater harvesting, Benefits of rainwater harvesting unit in buildings 3. Purpose of using Soak pit with Septic tank and Manhole and its sizing based on the requirement for different typologies of building.	1.Prepare Rain water harvesting unit layout for your college building using any Application software and demonstrat e.	1. Prepare rainwater harvesting unit layout for residential building drawings in CADD 2. Execute septic tank with soak pit and manhole drawings for building drawings in CADD
Total in hours			**39**	**13**	**52**

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits.

NOTE 2: The TUTORIAL (Activity criteria) shall be conducted / executed by the student (Minimum ONE suggested activity from each week) and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty.

4. Reference:

Sl. No.	Description
1	Building Planning and Drawing- **S.S. Bhavikatti, M.V. Chitawadagi,** I. K International Publishing House Pvt.Ltd
2	Civil Engineering Drawing and design – **D.N. Ghose (CBS Publishers)**
3	A textbook of Draughtsman Civil (Theory and Practical) – **R.S. Mallik and G.S. Meo(Asian publishers, New Delhi)**
4	CAD in Civil Engineering a Laboratory Referral- **Dr M.A. Jayaram, D.S.Rajendra Prasad, Sapna Book House**
5	Making a simple floor plan using AUTOCAD https://www.youtube.com/watch?v=hO865EIE0p0&t=384s

5. SOFTWARE/ LEARNIG WEBSITE:-

1. https://www.autodesk.com/learn/catalog/revit
2. https://www.autodesk.com/learn/catalog/autoCAD
3. https://www.autodesk.com/education/edu-software/overview?sorting=featured&filters=class-lab#card-acdist
4. https://www.machinedesignonline.com

(4th – SEMESTER)

Concrete Technology

Subject code – CIV401

1. Rationale: Diploma holders in Civil Engineering are supposed to supervise concreting operations involving proportioning, mixing, transporting, placing, compacting, finishing and curing of concrete. To perform above functions, it is essential to impart knowledge and skills regarding ingredients of concrete and their properties; properties of concrete in fresh and hardened stage, water cement ratio and workability; proportioning for ordinary concrete; concreting operations and joints in concrete.

2. Course Outcomes/Skill Sets: At the end of this course students will be able to

CO-01	Identify the ingredients of concrete, test the properties and study the behaviour of concrete ingredients to ensure it can be used for the given construction activity
CO-02	Design concrete mix proportions for required compressive strength and perform appropriate concrete operation procedures under a given exposure condition.
CO-03	Identify the types of admixtures based on its properties, behaviour and determine the type of admixtures to be used in concrete for a given construction activity.
CO-04	Differentiate between special concrete and conventional concrete with regards to composition, its applications and sustainability along with advantages and disadvantages of both.

3. Course Content

Week	**CO**	**PO**		**Lecture (Knowledge Criteria)**	**Tutorial (Activity Criteria)**	**Practice (Performance Criteria)**

				3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice ina week)
			1	Cement – Chemical composition, grades of cement, Tests on cement- fineness, normal consistency, specific gravity on cement.	1.Conduct field test on cement. 2. Conduct market analysis on price, grades and brand of cement.	1. a. Fineness test on Cement- sieve analysis by Blaine's air permeability test. 1.b. Normal Consistency test on cement.
			2	Setting time, Soundness and compressive strength of cement cube.		2. a. Initial setting time & final setting time test. 2.b. Specific gravity test on cement.
			3	Storing Cement: - (a) Storing of cement in the warehouse. (b) Storingof cement at site. (c) Effect of storageon strength of cement. Water -Quality of mixing water, Limits on the impurities as per ISI.		
			1	Fine aggregate – specific gravity, density, moisture content.	1.Conduct water absorption test on silt. 2.Compare properties of Manufactured sand with Natural River Sand	1. Test on Compressive strength of cement cube
			2	Bulking, sieve analysis, grading of fine aggregate, deleterious materials.		2. Fineness modulus, Specific gravity of fine aggregate
			3	Emerging trends in fine aggregate manufactured sand, P-sand, Filtered sand		
			1	Coarse aggregate - Importance of size, shape and texture, grading of coarse aggregates.	1. Study on Recycled coarse aggregate and prepare a report.	1. Bulking of Fine Aggregate-River sand, M-Sand, P-Sand.
			2	Sieve analysis, specific gravity, flakiness and elongation index of coarse aggregate.		2. Fineness modulus, Specific gravity of coarse aggregate.
			3	Moisture test, Impact test and abrasion test of coarse aggregate Storing of coarse aggregate at site.		

			1	Concrete, Behaviour of concrete- Hydration of cement, Bogue's compounds.	1.Study the advantages and uses of concrete in comparison to other building materials 2.Video demonstration on Hydration of cement and hydration process, Physical structure of hydrated cement	1. Flakiness Index, Elongation Index of coarse aggregate.
			2	Gel/space ratio, Water requirementfor hydration, Water Cement Ratio.		2. Absorption test and surface moisuretest on fine aggregateand coarse aggregates.
			3	Effect of various W/C ratios on the physical structure of hydrated cement.		
			1	Internal moisture, temperature, age, and size of specimen, cube strength.	1. Prepare Comparison report on different grades of concrete based on workability.	1. Slump Test on concrete for the nominal mix.
			2	Workability – Factors affecting workability, measurement of workability, Segregation and bleeding.		2. Compaction factor test for the nominal mix.
			3	Strength-a) Characteristic strength, (b) Durability, (c) Permeability Factors affecting strength, w/c ratio, maturity, effect of aggregate properties.		
			1	Compressive strength, split tensile strength, bond strength, modulus of rupture.	1. Study and demonstrate Pull out test on concrete.	1. Compressive strength test on concrete - cube strength.
			2	Modulus of elasticity, Poisson ratio, the relationship between these parameters. Aggregate-cement bond strength.		
			3	Shrinkage – plastic shrinkage and drying shrinkage, factors affecting shrinkage.		2. Non-destructive test on concrete. a) Ultrasonic Pulse Velocity test. b) Rebound Hammer test.
			1	Creep –Factors affecting creep, effects due to the creep of concrete,		1. Site Visit/Demonstration-

				measurement of creep, Permeabilityin concrete.	1. List the remedies for cracks in concrete.	Evaluation of Compressive strength by core cutter test.
			2	Factors contributing to cracks in concrete – Settlement cracks, Thermal expansion, and structural design deficiencies.		
			3	Concrete in Aggressive Environment: Alkali – Aggregate Reaction, Sulphate Attack, Chloride Attack, Acid Attack, Effect of Sea Water, Carbonation, special coating for Waterproofing, Freezing and thawing.		2. Demonstration- Permeability test on concrete.
			1	CONCRETE OPERATIONS: - Batching (a) Batching of cement (b) Batching of aggregate: Batching by volume, using gauge box, selection of proper gauge box, Batching by weight-spring balances and by batching machines. (c) Measurement of water.	1.IS Codal provisions for mix design of concrete. 2. Importance of bulking of sand in Volume batching	1. Concrete Mix Design as per ISCodes.
			2	Mixing (a) Hand mixing (b)Machine mixing-types of mixers, capacities of mixers, choosing appropriate size of mixers, operationof mixers, mixing of water. (c)Maintenance and care of machines.		
			3	Transportation Transportation with the use of the following- pans, wheelbarrows, transit mixers, chutes, belt conveyors,pumps, tower cranes.		2. Preparation of gauge box Demonstration on Handmixing and machine mixing.
			1	Ready Mix concrete Manufacturing of ready-mix concrete, Quality inspection of Ready-Mix Concrete in site. Precautions and care before, during and after concreting Using RMC	1. Visit the construction site and study the concrete operations	1. Demonstration on volume batching in site and Weigh batching in

			2	Compaction: (a) Hand compaction (b) Machine compaction-types of vibrators-internal and external vibrators Method of handling machine vibrators and its suitability for various situations.	like batching, mixing, transportation, compaction, finishing and curing of concrete and prepare a report.	RMC(semi-automated and fully automated)
			3	Finishing-screeding, floating, and towelling Curing: - Object of curing, Method of curing - conventional and advanced methods. Recommended duration for curing		2. Prepare the trail mix for the mix designand conduct test in fresh state (slump and compaction factor test) and hardened state (Succeeding week)
			1	Mineral admixture- Fly Ash, its Composition, properties, uses and advantages	1. Study on Natural fibres and artificial fibres and prepare a report	1. Prepare mix design and Conduct Slump test and compaction factor test on fresh concrete with mineral admixtures
			2	GGBS-its Composition, properties, uses and advantages		
			3	Silica fume- its Composition, properties, uses and advantages		2. Compressive strength test on hardened concrete with mineral admixture
			1	Chemical Admixture-Plasticizers, Super plasticizers- its Composition, properties, uses and advantages.	1. Conduct market analysis on chemical admixtures and compare.	1 & 2 Site visit to study the methodology of concrete Pumping to upper floors in construction site.
			2	Accelerators and Retarders- its Composition, properties, uses and advantages.		
			3	Air Entraining and Integral Waterproofing compounds- its Composition, properties, uses and advantages.		
			1	High strength concrete, High performance Concrete-Ingredients and preparation, advantages and application.	1. Compare the special concrete with conventional	1 & 2: Prepare mix design and conduct Slump flow test, V Funnel Test, L Box

					concrete and prepare report	Test, U Box Test to determine workability of Self Compacted concrete.
			2	Pervious concrete, high density concrete. -Ingredients and preparation, advantages and application		
			3	Self-compacting concrete-Ingredients and preparation, advantages and application		
			1	Fibre reinforced concrete. - Ingredients and preparation, advantages and application	Study on Reactive powder Concrete, Roller Concrete, Epoxy concrete	1 & 2 Compressive strength test on special concrete
			2	Geopolymer concrete - Ingredients and preparation, advantages and application		
			3	Lightweight concrete-Ingredients and preparation, advantages and application		
Total in hours						

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits

NOTE 2: The TUTORIAL (Activity criteria) shall be conducted / executed by the student (Minimum ONE suggested activity from each week) and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty

4. Reference:

Sl. No.	Description
1	Concrete technology- MS Shetty , Chand S and Co.
2	Concrete Technology, Tata McGraw Hill, New Delhi
3	Concrete Technology - Theory & Practice - R.S. Varshney
4	Relevant BIS codes

Building Estimation & Valuation

Subject code – CIV402

1. Rationale: The procedure of calculating the measures as per the working drawings and cost of various construction items is called an Estimate. Before initiating the construction works, the contractor/ owner should have thorough knowledge of the amount of work which is to be done and it's costing. For this purpose, it is very essential to have an estimated quantity of work and the total amount it is going to cost. Estimation helps us in knowing the quantity of work, labour, materials and funds that will be required for the entire project thus enabling us to be prepared beforehand. Valuation is the technique of estimation or determining the fair price or value of property such as land, a building, a factory, other engineering structures of various types, etc. Valuation of building or property is the method of calculating the present marketable cost of a building. Valuation of a building depends on the sort of building, its structure, durability, location, size, shape, and the width of roads, frontage, types and quality of building materials used and the cost of these materials.It is expected the students should know the basics of the same to apply it in the field. Through this course students will develop the desired skills and competencies which are expected from them for Estimation and valuation related works.

2. Course Outcomes/Skill Sets: At the end of the semester student will be able to:

CO-01	Study the importance of estimation and detailed specifications for the various items required for construction of different types of structures.
CO-02	Analyse the rates and study factors affecting the rates for all works by applying standard rates for a given construction project.
CO-03	Prepare Bill of materials, Bill of Quantities and valuation report for a given construction project.
CO-04	Prepare contract documents for a given construction project with Negotiation and project financing skills

3. Course Content

Week	CO	PO	Lecture (Knowledge Criteria)	Tutorial (Activity Criteria)	Practice (Performance Criteria)
			3 hours/week	1 hour/week	4 hours/week(2 hours/batch twice in a week)
			1.INTRODUCTION TO ESTIMATION Types of estimates. Roles and responsibility of estimator, Different items of works, unit of measurement andunits of payment of different items of work, Bill of Quantities 2.ANALYSIS OF RATES, purpose, importance and Procedure for rate analysis, rates of different construction materials, Categories of labours and theirskills, number of labours and daily wagesfor different items of work, 3.Load carrying capacity of different types of vehicles, transportation of materials and their hiring charges., GST charges, lead, lift, overhead charges, water charges and contractor's profit. factors affecting rate analysis	1. Prepare detailed report on Specifications of different items of work and study the importance of specification in Bill of Quantities 2. Analyse the rates for reusable materials in different construction activities	1. SPECIFICATIONS Earthwork in excavation for foundation, Cement concrete in foundation, Brick masonry, R.C.C Work, Plastering in Cement mortar, pointing with cement mortar, Cement concrete flooring, Granite /Vitrified / Marble flooring 2. Centering and shuttering works, Distempering, Exterior painting (Cement), Woodwork for windows and doors, Painting woodwork and steel, Glazing works for building, waterproofing systems
			Method of Analysis of rates for the following items of works 1. a) Earthwork excavation and filling b) Cement concrete bed in foundation c) Size stone masonry in Cement mortar for substructure 2. a) Brick masonry in C.M for superstructure b) Hollow concrete block masonry in Cement Mortar c) Solid concrete blocks masonry in Cement mortar for superstructure 3. a) Pointing with cement mortar b) Plastering with cement mortar c) Waterproofing - Terrace, bathrooms and toilets.	1. Conduct market analysis on the present rate of materials, Daily wages of labours, number of labours, transportation charges, hire charges for tools and equipment's for different items of work and Compare with the Standard	1 &2. Collect the present detailed Schedule of Rates and execute rate analysis in spreadsheet (For the lecture content for week 2)

				Schedule of rates	
			Method of Analysis of rates for the following items of works 1. a) CC Flooring, Granite / Vitrified / Marble flooring b) Painting of wall surface c) Painting of old and new wood work 2. a) Painting of Steel work b) Panelled and glazed doors 3.a) Panelled and glazed windows b) R.C.C roof slab c) Corrugated galvanized iron sheet roofing.	1.Prepare the rate analysis for different items of work by changing cost of materials and profit percentage and compare	1 &2. Collect the present detailed Schedule of Rates and execute rate analysis in spreadsheet (For the lecture content for week 3)
			1.Introduction to methods of estimation: long wall short wall method and centre line method of estimation, Standard Format for measurement sheet, Rules fordeduction of doors, windows and opening in Masonry work, Plastering andPainting work 2. One room building- Ground floor with flat RCC roof (Long wall short wall method) 3. Two room building- Ground floor with pitched roof (Centre line method)	1. Extract measurements from existing AUTOCAD drawing file 2.Compare between long wall short wall method and centre line method of estimation	1. Execute the detailed and abstract estimate using long wall short wall method using spreadsheetfor One room building- Ground floor with flat RCCroof (Long wall short wall method) 2. Execute the detailed and abstract estimate using long wall short wall method using spreadsheetfor Two room building- Ground floor with pitched roof (Centre line method)
			Explain the methodology of Quantity estimation of the following. 1. Detailed and abstract estimate of buildings using long wall short wall Method - 1BHK Residential building - Ground floor with Pitched roof with load bearing wall. 2. Detailed and abstract estimate of buildings using long wall short wall Method -2BHK Residential building - Ground floor with flat RCC roof having semi-circular/ Hexagonal room walls (load bearing walls).	1. Prepare the BOQ for the residential building drawing from real time projects (ongoing construction projects) using Spreadsheet 2. Extract measurements from existing	1. Execute the detailed and abstract estimate using long wall short wall method using spreadsheet for 1 BHK Residential building - Ground floor with Pitched roof with loadbearing wall. 2. Execute the detailed and abstract estimate using long wall short wall method using spreadsheetfor 2BHK Residential building - Ground floor

			3. Detailed and abstract estimate of buildings using long wall short wall Method -2BHK Residential building - Ground floor with flat RCC roof with portico / canopy.	AUTOCAD drawing file.	with flat RCC roof for with portico / canopy having semi-circular/ Hexagonal room walls
			Explain the methodology of Quantity estimation of the following. 1.Detailed and abstract estimate of buildings using long wall short wall Method for Commercial building – Ground floor with flat RCC roof involving Aluminium Composite panels for facing 2 & 3: Detailed and abstract estimate of buildings using long wall short wall Method Industrial building – (Ground floor +1) with flat RCC roof and framed structure	1.Prepare the BOQ for the Commercial building drawing from real time projects (ongoing construction projects) using Spreadsheet 2. Extract measurements from existing AUTOCAD drawing file	1. Execute the detailed and abstract estimate using long wall short wall method in using spreadsheet for School building – Ground floor with flat RCC roof 2. Execute the detailed and abstract estimate using long wall short wall method using spreadsheetfor Industrial building – (Ground floor +1) with flat RCC roof and framed structure
			Explain the methodology of Quantity estimation of the following. 1. Detailed and abstract estimate of buildings using Centre Line Method - 1BHK Residential building - Ground floor with Pitched roof with load bearing wall. 2.Detailed and abstract estimate of buildings using Centre Line Method - 2BHK Residential building - Ground floor with flat RCC roof having semi-circular/ Hexagonal room walls (load bearing walls) 3. Detailed and abstract estimate of buildings using Centre Line Method - 2BHK Residential building - Ground floor with flat RCC roof with portico / canopy	1. Prepare the BOQ for the Industrial building drawing from real time projects (ongoing construction projects) using Spreadsheet 2. Extract measurements from existing AUTOCAD drawing file	1. Execute the detailed and abstract estimate using the Centre Line method using spreadsheet for 1 BHK Residential building - Ground floor with Pitched roof with load bearing wall. 2. Execute the detailed and abstract estimate using Centre Line Method in using spreadsheet for 2BHK Residential building -Ground floor with flat RCC roof with portico / canopy having semi-circular/ Hexagonal room walls
			Explain the methodology of Quantity estimation of the following.	1.Prepare comparison statement with BOQ of	1. Execute the detailed and abstract estimate using centre line method using spreadsheet for School

			1.DETAILED AND ABSTRACT ESTIMATE OF BUILDINGS USING Centre lineMethod Commercial building – Ground floor with flat RCC roof involving structural glazing for facing 2 & 3: DETAILED AND ABSTRACT ESTIMATE OF BUILDINGS USING Centre Line Method Industrial building – (Ground floor +1) with flat RCC roof and framed structure	residential, commercial and industrial buildings 2. Study on application of various softwares used for estimation and demonstrate	building – Ground floor with flat RCC roof 2. Execute the detailed and abstract estimate using centre line method using spreadsheet for Industrial building – (Ground floor +1) with flat RCC roof and framed structure
			Prepare the Bill of materials for the following in residential building 1. Water supply fittings and fixtures 2. Sanitary Fittings and fixtures 3. Electrical Fittings and fixtures and fire fighting system	1.Conduct market analysis and prepare the rate analysis for plumbing, electrical and firefighting fixtures and fittings work 2.Extract measurements from existing AUTOCAD drawing file	1. Execute the detailed and abstract estimate using spreadsheet for Plumbing layout (Water supply and sanitary fittings) for residential building 2. Execute the detailed and abstract estimate using spreadsheet for Electrical and fire fighting fittings for residential building
			Prepare the Bill of materials for the following in Commercial building 1. Water supply fittings and fixtures 2. Sanitary Fittings and fixtures 3. Electrical Fittings and fixtures and fire fighting system	Prepare the Bill of materials, detailed and abstract estimate for the following in Industrial building 1. Water supply fittings and fixtures 2. Sanitary Fittings and fixtures 3. Electrical Fittings and fixtures and fire fighting system	1. Execute the detailed and abstract estimate using spreadsheet for Plumbing layout (Water supply and sanitary fittings) for commercial building 2. Execute the detailed and abstract estimate using spreadsheet for Electrical and firefighting fittings for commercial building

			Prepare the Bill of materials for the following for a residential building 1. Septic tank with soak pit 2. Manhole 3. Rain water harvesting unit	1.Prepare Bill of materials, detailed and abstract estimate for rainwater harvesting unit in college campus	1. Execute the detailed and abstract estimate using spreadsheet for) for septic tank with soak pit and manhole 2. Execute the detailed and abstract estimate using spreadsheet for Rain water harvesting unit for a residential building
			1. Quotation preparation, Importance of Specification, rate analysis and quantity estimation in preparation of quotation, Negotiation with stakeholder in terms of estimation, Factors affecting negotiation 2. Project Financing: Factors affecting project financing, different types of loans for project , Loan agreement and Agreement with the stakeholder, Documents to be produced to stakeholder and loan approval, Repayment of loan 3.Work order, Payment Schedule: Advance payment, payment according to area of work, payment according to floor wise work, Retention details	1. Conduct a Detailed study about Negotiation and Project financing for an ongoing project and prepare a report	1. Preparation of complete report having survey drawings, working drawings, BOQ, detailed and abstract estimate, payment schedule and work order for project
			VALUATION 1.Necessity of valuation, Important terms used in valuation, Scrap value, Salvage value, Market value, Book valueand sinking fund. 2. Depreciation, Classification of buildings based on the life of a building and depreciation. 3. Methods of valuation & Fixation of rents.	1. Study factors for real time valuation of building / land and prepare report	1.Execute the calculations of sinking fund and valuation of building using depreciation method using spreadsheet 2. Execute the calculation of rent fixation using spreadsheet
Total in hours					

NOTE 1: NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits

NOTE 2: The TUTORIAL (Activity criteria) shall be conducted / executed by the student (Minimum ONE suggested activity from each week) and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty

4. Reference:

Sl. No.	Description
1	Dutta B N, "*Estimation and costing in civil engineering theory and practice"*, 27 edition, UBS Publishers Distributors (P) Ltd New Delhi. Chakra borty M, *"Estimating, costing and specifications in Civil Engineering"-2006.*
2	D.D.Kohli Ar.R.C.Kohli, "*Estimating and Costing(CIVIL)"*2013 edition, S.CHAND Publications
3	IS: 1200 Part 1 to 28, *Method of Measurement of Building and Civil Engineering Works.*
4	Rangwala S C,*"Valuation of Real properties"*Charotar Publishing House -2008.
5	Full building estimation in spreadsheet https://www.youtube.com/watch?v=ocZu5wjh-88

Site Management

Subject code – CIV403

1. Rationale: Site management is a key element of the integrated project team. Site management is beneficial to society as the effective and efficient management of construction projects which will avoid escalation of costs, time overrun, wastage of resources, unlawful exploitation of labour and pollution of environment and safety precautions. Site management makes sure that the various tasks are conducted smoothly. Without site management, workers might not be authorized to work on their appointed tasks on time, equipment might not be distributed etc. It is expected that the students should know the basics of the same to apply it in the field. Through this course students will develop the desired skills and competencies which are expected from them for site management related works

2. Course Outcomes/Skill Sets: At the end of the semester, students will be able to

CO-01	Prepare a construction site plan on a project-specific basis to include phasing, temporary utilities and facilities, vertical and lateral transportation, storage facilities, security, safety, lighting, and environmental requirements.
CO-02	Manage staffing requirements including hiring, replacement and clearly articulate the roles of each individual recruited to operate while managing specific activities of construction at a given project site.
CO-03	Collect data and perform calculations periodically to enable an estimator to propose alternative construction methods, the right labour mix, equipment utilization and quality of construction for a given construction project.
CO-04	Implement an effective communication system, rigorous record keeping, safe keeping on site of product samples, project submittals, drawings etc and ensure compliance with safety norms as per OHSAS standards.

3. Course Content

Week	CO	PO	Lecture (Knowledge Criteria)	Tutorial (Activity Criteria)	Practice (Performance Criteria)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
			MOBILIZATION AND JOB LAYOUT 1. Concept of Key Plan & Job plan. Mobilization of construction sites. 2. Role of the owner, contractor & designer. Organization chart for private& government bodies. 3.Work Breakdown Structure, Turnkey operation.	1.Study and prepare a report on Mobilization work and job layout for differenttypes of buildings.	1. Preparation of Key Plan, Job Layout using BIM tool like Revit/Sketch up/AutoCAD. 2. Presentation on work breakdown structure & organization structure.
			1. Preparation of a layout plan for a residential area showing LIG, MIG and HIG houses and other amenities. 2. Preparation of a layout plan for an industrial area. 3. Concept of Bidding, Bid Terminologies, Bid Template, Bid form.	1. Collect a case study on bidding and prepare a report.	1. Collect local body by law & prepare a layout plan for LIG, MIG & HIG of small residential area using AutoCAD/Sketch up/Revit 2. Collect local bodies by law & prepare a layout plan for industrial areas using AutoCAD/Sketch up/Revit.
			1.CONTRACT & TENDERING: -Types of contracts, contract agreement, Tender- Pre tender & Post tender planning. 2. Procedure for inviting tender- Tender Notice & Tender documents, E-tendering process, E-procurement system.	1. Study on Project Feasibility. BOT, BOOT, PPP. and prepare a report	1. Procedure for uploading a tender in e-procurement. 2. Prepare & present process of tender/E-tender.

			3. Acceptance of contract documents and issue of work orders, duties and liabilities, completion certificate, right ofcontractor, refund of deposit.		
			1. EMD, Security deposit & Guaranties, Scrutiny of Tenders 2. Tender forms, comparative statements, administrative approval, technical sanction 3.Conditions for failure of contract and its extension, Termination of contract	1. Prepare & present tender documents	1. Prepare comparative statements of tender and checklist for applying & selecting Tender. 2. Prepare administrative approval& Technical approval report of any public/resident/industr ial building.
			1. Nominal muster roll, measurement book, method of recording bills. 2. Pre-Measurements, check measurements, preparation of bills (Concept of RA bill- submission, scrutiny and payment.) 3.Ledger accounts, Imprest Account, Cashbook, Suspense classification, Term DPR (daily productivity report), importance of DPR	1. Site visit & data collection. 2. Prepare & present procedure of DPR.	1. Collect & study measurement books of any residential building, industrial building & public building. 2. Collect & study Cash Book, RA bill & Ledgeraccount.
			1. STORES-Classification of Stores. Issues, Indents & Bin cards - maintenance inspection, inventories. 2. Work procedures adopted in P.W.D, KUWSSB, Irrigation, ZP, CMC and C.P.W.D. 3. Site Order book, Hindrance Register, Drawing Register.	1. Site visit & data collection. 2.Prepare drawing register, site order, bin card	1.snagging checklist (Snagging1-upto door & window clearance Snagging2-upto paint clearance Snagging3-Joint/grout filling clearances Snagging4-handover clearance). 2. Prepare working procedure of
			Project clearance procedure: Term Snagging, stages of snagging. Tools used		government organization &

			for snagging.		responsibilities of technocrats.
			1. Introduction to Building Information Model (BIM), Introduction to project management tools like ERP, SAP, PRIMAVERA, MSP, Project Kick start,Smarta etc. 2. Sequence of construction activity. 3. PLANNING AND SCHEDULING: Project Organization	1. Conduct a Case study on Project Management tools like ERP, R CONSTRUCT, QUADRA, SAP, MSP, PRIMAVERAetc...	1.Prepare schedule for any building from mobilization to Lintel work using MS project/PRIMAVERA 2.Prepare schedule for any building(continue) from Lintel to Slab casting using MS project/PRIMAVERA
			1. Bar Charts. Gantt chart 2. Networking techniques 3. Development of a network using CPM with simple problems.	1.Site visit	1.Prepare schedule for any building (continuous) slab casting to door & window fixing using MS project/PRIMAVERA
			1. Line of Balance Scheduling 2.Simple problem on PERT 3. Time-Cost Trade-off, Cost Control in Construction. Importance of Management Information System.	1.Site visit & data collection 2. Prepare Working tracking report using spreadsheet.	1.Prepare schedule for any building(continue)from door & window fixing to hand over using MS project/PRIMAVERA
			1. RESOURCE MANAGEMENT: Resource Planning, allocation and levelling. 2. Introduction to Material Management, Purchase management and inventory control. 3. Importance of PR (Purchase request), PO (Purchase order), WO (work order), GRN (goods received note).	1. Site visit.	1 Site visit & prepare Lead time chart for A, B & C class materials & link with scheduling. 2. Calculate man hours for construction activity & link with scheduling.
			1.ENVIRONMENTAL HEALTH AND SAFETY(EHS): ACCIDENTS-definition of accident terms: (Partial & total disablement,	1. Case study on hazards in construction.	1 & 2. Site visit & Prepare safety checklist for construction activity.

			Injury frequency rate, injury severity rate). 2. Accident- Causes, Precaution & Prevention in each construction activity. Hazards on Construction Sites 3. SAFETY- Importance of safety. Safety procedures and checklist for each construction activities as per OHSAS	2. Demonstrate on Safety measures in construction site personal protective kit, Toolkits according to construction activity	
			1. Safety meetings, Safety measures for storage, handling of building material and execution. 2. QUALITY MANAGEMENT: Total Quality Management (TQM)- Introduction, Importance & Functions of total quality management in the construction industry. 3. Tools for quality control, Elements and requirements of quality management.	Study the advanced techniques used to improve the quality of construction.	1.Field visit and demonstration 2.Prepare Third- party certification, Concept of ISO, Features of ISO9000 series, Benefit of ISO9000(ISO Certification, NABLcertification)
			1. Aims and ways of TQM. BIS certification of quality system. 2.Claims, compensation and disputes, Dispute resolution techniques, Introduction to Arbitration and Conciliation Act 1996 – case studies 3.Acts & Labour Laws	Site visit & data collection	1 & 2: Case study on preparation of technology manual for each activity
Total in hours					

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits

NOTE 2: The TUTORIAL (Activity criteria) shall be conducted / executed by the student (Minimum ONE suggested activity from each week) and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty

4. Reference:

Sl. No.	Description
1	**Town Planning** by Rangwala
2	Collier, Kieth, "**Managing Construction Contracts**"
3	Gajaria GT, **"Law Relating to Building & Civil Engg. Contracts in India**"
4	Frank Harris and Roland McCaffer, "Modern Construction Management"- 4th Ed. Blackwell ScienceLtd. 2009
5	Chitkara K K, "**Construction Project Management, Planning, Scheduling and Controlling**,McGraw Hill Education, 3rd Ed., 2014
6	Srinath L.S, **"PERT and CPM**", East West Press Pvt Ltd New Delhi
7	Peurifoy. R L, **"Construction Planning, Equipment and Methods**"- McGraw Hill.
8.	www.eprocure.gov.in
9.	www.OHSAS.co.in
10.	ISM codes (International safety management)

Design and Detailing RCC Structures

Subject code – CIV404

1. Rationale: This course is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RCC Construction and fabrication. Students may also be required to design simple structural elements, make changes in design depending upon availability of materials This subject thus deals with elementary design principles as per IS: 456.

2. Course Outcomes/Skill Sets: At the end of the semester student will be able to,

CO-01	Identify the various structural RCC elements of a building for a given construction project.Explain the concept of Limit state design of Reinforced Cement Concrete (RCC).
CO-02	Explain the difference between the structural behaviour of different reinforced concrete structural elements through demonstration experiments and data analysis.
CO-03	Design, draft and detail different elements of reinforced concrete structural systems subjected to gravity, dead and live loads as per IS codes.
CO-04	Prepare bar bending schedules for different structural elements of buildings as per structural detailed drawing.
CO-05	Fabricate reinforcement for structural elements as per detailed drawing and Barbendingschedule.

NOTE: Detailing and drafting shall be done in AUTOCAD.
Barbending Schedule and Material calculation shall be done in a spreadsheet.
Prototypes shall be created at the end of each week by each student
Tools used during fabrication of steel shall be taught and safety protocol shall be followed in site/field.

3. Course Content

Week	CO	PO	Lecture (Performance Criteria)		Tutorial (Activity Criteria)	Practice
			3 hours/week		1 hour/week	4 hours/week (2 hours/batch twice in a week)
			1	Introduction: Concept of reinforced cement concrete structures, Different grades of concrete and steel used in RCC. Load and loadingstandards as per IS: 875.	1. Study different codal provisions	1 & 2 Demonstrate concept of density, Load and Loading standards for materials
			2	Design Based on Limit State Method: -Fundamentals of Limit State Method, types of limit state.		
			3	Introduction to stress block parameters, Assumptions in the theory of simple bending for RCC beams, Neutral Axis, Moment of resistance.		
			1	Critical neutral axis, actual neutral axis. Concept of under reinforced, balanced and over-reinforced sections.	1. Study the Codal provisions for development Length of bars, Side face reinforcement, Nominal Cover to reinforcement.	1 & 2: Demonstrate Failure modes of RCC structural elements with Videos and Photos.
			2	Concept of balanced, under reinforced and over-reinforced sections.		
			3	Partial safety factors, Flexural strength, Shear Strength, Concept of Deflection and cracking, Design requirements.		
			1	Beams: Design Concept of Simply supported and cantilever singly reinforced Beams as per IS 456-2000.	1. Prepare Barbending schedule for singly reinforced simply supported	1 & 2: Detailing and Drafting of Singly Reinforced simply supported beam as per codal provisions.

			2 & 3	Analysis and design of Singly reinforced simply supported beam.	beam using spreadsheet.	
			1	Continuation	1. Prepare Bar bending schedule for singly reinforced cantilever beam using spreadsheet	1 & 2: Detailing and Drafting of Singly Reinforced cantilever beam as per codal provisions
			2 & 3	Analysis and design of singly reinforced cantilever beam		
			1	Beams: Design Concept of Doubly reinforced Simply supported and cantilever Beams as per IS 456-2000	1.Prepare Bar bending schedule for Doubly Reinforced simply supported beam 2.Prepare Bar bending schedule for Doubly Reinforced cantilever beam	1. Detailing and Drafting Doubly Reinforced simply supported beam as per codal provisions.
			2	Analysis & Design of Doubly reinforced simply supported beam		2. Detailing and Drafting of Doubly Reinforced cantilever beam, as per codal provisions.
			3	Analysis & Design of Doubly reinforced cantilever beam		
			1	Design Concept of RCC One way slab.	1.Prepare Bar bending schedule for one way slab 2.Prepare a report on the design of economic section by optimization of materials.	1 & 2: Detailing and drafting of one-way slab as per codal provisions.
			2	Analysis of one-way slab.		
			3	Design of one-way slab.		
			1	Design concept of RCC two-way Slab	1.Prepare Bar bending schedule for two-way slab	1: Detailing and drafting of two-way slab as per codal provisions- Corners are not held down 2: Detailing and drafting of two-way slab as per codal provisions- Corners are held down
			2	(iii) Design of Two-way slab: a) Corners are not held down: All the Four edges discontinuous case only.		

			3	(iii) Design of Two-way slab: b) Corners are held down: All the Four edges discontinuous case only.		
			1	Design Concept of One-way continuous slab (Two span only) using moment coefficient as per IS: 456.	1.Prepare Bar bending schedule for one-way continuous slab 2.Prepare Bar bending schedule for two-way continuous slab	1. Detailing and Drafting of one-way Continuous slab, as per codal provisions
			2	Design of Two-way continuous slab: All the Four edges continuous case only.		2. Detailing and Drafting of two-way Continuous slab as per codal provisions
			3			
			1	Columns: Concept of long and short columns, Specifications for main and lateral reinforcement, interaction diagram in column design, Behaviour of RCC column under axial load.	1.Prepare Bar bending schedule for column (Square and rectangle)	Detailing and Drafting of Axially loaded short columns (square and rectangular as per IS specifications),
			2	Analysis and Design of Axially loaded column		Detailing and drafting of column subjected to uniaxial bending (square and rectangularas per IS specifications)
			3	Design of column subjected to uniaxial bending for reinforcement distributed equally on TWO sides only using SP-16 chart (Square and Rectangular).		
			1	Design of Column Footings: Concept of column footing, Design criteria for square, rectangular isolated column footings,	1.Prepare Bar bending schedule for isolated column footing (Square and rectangular)	Detailing and drafting of isolated column footing (square and rectangular) as per IS specification
			2	Design of square, rectangular isolated column footings,		
			3	Continuation		
			1	Design of Stairs: Introduction to stairs, Design of dog-legged stairs as per codal provisions.	1.Prepare Bar bending schedule for Stairs.	1.Detailing and Drafting of dog legged stair (with

						waist slab) as per codal provisions
			2	Single flight stairs-Waist slab		2.Detailing and Drafting of Folded/chain stair as per codal provisions.
			3	Design of Folded/Chain link stairs.		
			1	Design of Lintel with chejja: Introduction to lintel with chejja	1.Prepare Bar bending schedule for lintel with chejja	Detailing and drafting of lintel with chejja as per codal provisions
			2	Design of lintel with chejja		
			3	Continuation		
			1	Field Practice on bar fabrication for Beam, slab, column, column footing, lintel with chejja and field/site visit		
			2			
			3			
Total in hours						

NOTE 1: The course content shall be delivered through lectures, PowerPoint presentations, video demonstrations and field visits

NOTE 2: The TUTORIAL (Activity criteria) shall be conducted / executed by the student (Minimum ONE suggested activity from each week) and to be submitted in portfolio evaluation of activities through rubrics to the faculty.

NOTE 3: The PRACTICE (Performance criteria) shall be conducted by the student and observations and report to be submitted at the end of each session to the faculty.

Reference:

Sl. No.	Description
1	Design of Reinforced Concrete Structures by S Ramamrutham& R Narayan
2	Reinforced Concrete Structures by B C Punmia
3	SP-16 Design aid for IS 456-2000, SP-23 Handbook on concrete mixes
4	BIS, IS 456 – 2000 Code of Practice for Plain & Reinforced Concrete