GONDWANA UNIVERSITY, GADCHIROLI

(MIDC Road Complex, Gadchiroli-442605)

V Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC503

Title of Course: Theory of Structure

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to

CO1 ***Identify*** types of structures and suitable method of analysis.

CO2 ***Draw*** Influence line diagrams for determinate beams and trusses and select the maxima for the function.

CO3 ***Analyze*** determinate and indeterminate beams and frames

CO4 ***Understand and apply*** the column analogy method to analyze indeterminate structures effectively.

CO5 ***Analyze*** the skeleton structures using structure approach and member approach of stiffness matrix method.

Unit	Content	Hours
I	Analysis of fixed and continuous beams by **Theorem of Three Moments**, effect of sinking of support. **Slope deflection** method as applied to indeterminate beams & continuous beams.	8
II	**Influence Line Diagram**: Rolling loads on simply supported beams, concentrated and uniformly distributed loads, maximum B.M. and S.F. Influence lines for reactions, bending moments and shear forces in simply supported beams, cantilevers and beams with overhangs.	9
III	**Moment Distribution Method**: Analysis of continuous beams and simple portal frames (Non sway and sway).	10
IV	**Column Analogy:** Column Analogy method, Applications to beams, Calculations of Stiffness factors and carry over factors for non-prismatic member.	6
V	**Matrix Method**: Formulation of element/local stiffness matrix and global stiffness matrix for beam members (with and without axial deformation). Continuous beams without sinking of support, Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated load, uniformly distributed load.	12

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Text Books:

1. Strength of materials (vol.1 & 2) , S.P.Timoshenko, McMillan & Company, London
2. Gere and Weaver, Matrix Method of Structural Analysis, Third Edition, Von Nostrand Reinhold; New York 1990.

Reference Books:

1. Meghre A.S. and Deshmukh S.K., Matrix Method of Structural Analysis, First Edition, Charotar Publishing House, Anand 2003.
2. Comprehensive structural analysis by A.K. Jain, Laxmi publication.
3. Theory of structure by S. Ramamrutham Dhanpat Rai Publication, 1993
4. Basic structural analysis By C. S. Reddy Mc Grew Hill Publication.

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V Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC504

Title of Course: Geotechnical Engineering.

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	1	--	4	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to

CO1 ***Explain*** various physical and index properties of soil, their lab determination and classify soils based on index properties of soils and as per IS codal provisions.

CO2 ***Determine*** permeability of soil, and graphically plot the flow net and determine the seepage quantities.

CO3 ***Determine*** compaction properties of soil and select suitable field method of compaction based on the type of soil.

CO4 ***Compute*** the vertical stress in a semi-infinite soil mass due to various loading conditions and plot various stress distribution diagrams in a soil mass.

CO5 ***Determine*** shear strength parameters of different types of soils for various geotechnical analyses.

Unit	Content	Hours
I	**Properties of Soil**: Introduction to Soil Mechanics, major soil deposits of India such as marine deposits, black cotton soils, lateritic soils, alluvial deposits and desert soils. Three phase soil system, weight volume relationships, index properties of soil - methods of determination and its significance, I.S. classification of soil. Soil structure: single grained and honey combed, flocculated and dispersed. Permeability and Seepage: Darcy's law, Factors affecting permeability, Determination of permeability by constant head and falling head method as per IS - 2720, field test as per IS – 5529 (part I) - pumping in test and pumping out test. Permeability of layered soils, Seepage forces, General flow equation. Flow net and its application.	9
II	**Compaction and Consolidation**: Soil compaction phenomenon, Factors affecting compaction. Dry density and moisture content relationship. Zero air voids line, Effect of compaction on soil structure. Standard Proctor test and Modified Proctor test as per IS – 2720. Field compaction equipment and methods for cohesive and non- cohesive soils, Introduction to consolidation, coefficient of consolidation, Degree of consolidation, Determination of pre consolidation pressure.	9
III	**Shear Strength of Soil and bearing capacity**: Mohr's circle, Mohr-coulomb failure criteria, Effective stress concept. Peak and residual shear strength. Factors affecting shear strength. Laboratory measurement of shear strength by direct, unconfined and triaxial tests under different drainage conditions. Vane shear test. Bearing Capacity of Foundation: Types of foundations, Terzaghi's and Meyerhof bearing capacity analysis, effect of various BC factor on bearing capacity, Shear failure and Settlement criteria, Use of field test (SPT and Plate Load) data for bearing Capacity determination.	9

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IV	**Lateral Earth Pressure**: Earth pressure on vertical wall, effect of wall movement on earth pressure, earth pressure at rest, Rankine's theory, lateral earth pressure due to submerged backfill, backfill with uniform surcharge, backfill with sloping surface, Coulomb's theory, Cullman's method, Poncelet's construction.	9
V	**Stability of Slopes**: Slope classification, slope failure, modes of failure. Infinite slope in cohesive and cohesion less soil, slope stability analysis using Swedish Slip Circle Method, Friction Circle method.	9

Text Books:

1. Gopal Ranjan and A.S. Rao, "Basic and Applied Soil Mechanics", G. K. Publications pvt. Ltd
2. V. N. S. Murthy, "Soil Mechanics and Foundation Engineering", B.S.Publications (3 rd. Edition)
3. B. C. Punmia, "Soil Mechanics and Foundation Engineering", Laxmi Publishing Co., New Delhi

Reference Books:

1. Joseph E Bowles, "Engineering Properties of Soils and Their Measurements", McGraw Hill Publications (2001).
2. Lambe and Whitman, "Soil Mechanics", S. Chand publications (SI Version) (1969).
3. Donald P Coduto, Man-chu Ronald Yeung and William A. Kitch "Geotechnical Engineering Principle and practice", McMillan Press (PHI) (2010).

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V Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC505

Title of Course: Water Supply Engineering

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	30	20	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Understand*** the importance and necessity of water supply scheme in ensuring safe and adequate water for public use.

CO2 ***Understand*** the methods and design of water convenience system for efficient distribution from source to consumer.

CO3 ***Evaluate*** water suitability for various uses by assessing its physical, chemical and biological characteristics.

CO4 ***Understand*** various water treatment processes to ensure safe and potable water supply.

CO5 ***Understand*** the principle and types of filtrations used in water treatment to remove impurities and ensure water quality.

Unit	Content	Hours
I	**Introduction: Importance and necessity of water supply scheme.** **Water demand:** Types of demand, empirical formulae factors affecting per Capita demand, variation in demand, design period and population forecasting methods and examples. **Sources of water**: Rain water, Ground water – springs, infiltration galleries, dug wells, tube wells, Surface water – stream, lake river, impounding reservoirs, ponds. **Intake structures**: Location types – river, lake, canal reservoir etc.	9
II	**Conveyance of water:** Types of pipes joints, fittings. **Hydraulic design aspects**: Head loss due to Friction: Manning's formula, Darcy's weisbatch formula, Hazen Williams's formula and problem. **Rising main and pumps**: Classification, working, merits and demerits, selection of pumps. **Distribution systems**: Requirements for a good distribution system, Methods of distribution systems distribution systems and layouts of DS, appurtenances in water distribution system. Leakage and leak detector.	10
III	**Water Quality:** Water Quality Standards, water borne diseases, Physical characteristics: colour, taste and odor, temperature, turbidity. Chemical characteristics: total solid, chlorides, hardness, pH value, metals and other chemicals, nitrogen, dissolved gases. And bacteriological characteristics of water, Standards of drinking water	8
IV	**Water treatment**: Objective of treatment, unit, operations and processes, treatment flow sheet of conventional water treatment plant. **Aeration:** Purpose, types of aerators. **Coagulation and Flocculation**: Definition, Principals, types of coagulants and reactions,	9

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	coagulant doses, types of mixing and flocculation devices. **Sedimentation:** Principles, types of setting basins, inlet and outlet arrangements. **Clariflocculators:** Principles and operation.	
V	**Filtration:** Mechanism of filtration, types of filters, RSF, SSF, pressure filters, elements of filters UDS, design aspects filter sand specification ES, UC, operational problems in filtration. **Disinfection**: Purpose, Mechanism, criteria for good disinfectant, various disinfectants their characteristics, disinfection by chlorination using different forms of chlorine.	9

Reference Books:

1. Environmental Engg (vol 1 & 2) by B.C.Punmia, Laxmi Publication
2. Environmental Engg. (Vol. 1&2) by S.K.Garg.
3. Environmental Engg.by Birdee, Dhanpat Rai and Sons, 1996.

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GONDWANA UNIVERSITY, GADCHIROLI

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V Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPECCEC506A

Title of Course: (Program Elective –I) TRANSPORTATION ENGINEERING -I

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to

CO1 ***Understand*** the principles of transportation system development and planning for sustainable urban and regional mobility.

CO2 ***Understand*** the concept of geometric design of road and use the data for road design.

CO3 ***Identify*** highway materials and distinguish between types of pavements based on design and usage.

CO4 ***Understand*** the functions of various components of bridge and carry out hydraulic design of bridge.

CO5 ***Understand*** types of bridge superstructure and apply basic concept of their construction.

Unit	Content	Hours
I	**Development and Planning** – Road transport Characteristic, Classification of roads, development plans, network patterns, data collection and surveys, principles of alignment, evaluation of plan proposals. **Traffic Engineering**:3E`s of, traffic characteristics, Surveys, Intersection-type, layouts, design principles, Urban traffic, parking, lighting, Accidents, Traffic control Devices-marking, Sign, Signals, Regulation Motor Vehicle Act and Rule.	7
II	**Geometric Design** – Road, road user & road vehicle characteristics, Factors affecting design standards. Cross Section elements, stopping & overtaking sight distance overtaking zones. Horizontal alignment –Curves, design of super elevation, widening, transition curves, vertical alignments, Design of summit & Valley Curves, I.R.C. standards for Geometric Design, Geometric, Geometrics of Hill Roads. Types of pavements.	10
III	**Materials**: Subgrade Soil –AASHO Classification, group Index, Subgrade soil Stabilization. CBR, aggregates physical and mechanical properties & tests Bituminous materials – classification sources properties and tests. Cutback & Emulsions, IRC/IS standards, Introduction to Geotextiles. **Construction & Maintenance**: IRC, most specifications for quality &quantity highway construction and maintenance of earthen / gravel road, WBM and WMM, Bituminous pavement, cement concrete pavement, pavement failures.	10
IV	**General Bridge** : Components of BRIDGE , classification and Identification, Data	9

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	Collection site Selection. Economic Span. **Hydrology**: Estimation of flood, discharge, water way, scour depth, depth of Foundation, Afflux, clearance and free board. Loads, Forces, Stresses – IRC Specification & code of practices, critical Combinations. **Sub-Structure**: (A)Types of foundations & their choice, estimation of BC of foundation strata, Open, pile and well foundation, pneumatic Caissons, cofferdams. (B)Abutment, piers & Wing-walls and their types, general design principles.	
V	Super Structure: Different structural forms culverts, causeways, minor and major bridges, suitability and choice, precast, post tensioned and segmental Construction. Launching, operation systems, Bearings, Architecture. Rating and Maintenance: Methods & Techniques of rating of existing bridges Inspection, Repairs, maintenance, corrosion-causes and prevention, Aesthetics.	9

Text Books:

1. Highway Engineering Khanna and Justo Nem Chand.
2. Bridge Engineering by S.P.Brindra Dhanpat Rai Publication.
3. Bridge Engineering by S.C.Rangwala Charotar Publishing House Ptv.

Reference Books:

1. Principles and practices of Highway Engineering by S.K. Sharma Khanna Publication.
2. Pavement Design: Yoder and Witzak Wiley.
3. Traffic Engineering: L.R.Kadiyali Khanna Publishers.

GONDWANA UNIVERSITY, GADCHIROLI

(MIDC Road Complex, Gadchiroli-442605)

V Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPECCEC506B

Title of Course: (Program Elective –I) Hydrology

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to

CO1 ***Understand*** the scope, significance and components of the hydrological cycle in water resource engineering.

CO2 ***Analyze*** various abstraction processes such as evaporation, infiltration, and transpiration affecting the hydrological cycle.

CO3 ***Evaluate*** runoff characteristics and estimate surface runoff using empirical and analytical methods.

CO4 ***Apply*** statistical techniques for frequency analysis and interpretation of hydrologic data.

CO5 ***Understand*** the occurrence movement and quantification of ground water applies methods for well hydraulics and aquifer analysis.

Unit	Content	Hours
I	**Introduction**: Hydrological cycle, water balance equation, Precipitation-forms And types, equipment's, methods of measurement. Optimum number of rain gauges, Radar measurement of rainfall, Estimation of missing rainfall data.	9
II	**Abstractions**: Infiltration- Definition, mechanism, factors affecting, infiltration indices, measurement. Evaporation, Transpiration-Definition, mechanism, Factors affecting evaporation, Estimation by pans, water budget, energy budget and empirical formula, Methods control of evaporation, evapotranspiration, interception.	9
III	**Runoff**: Sources and components of runoff, Classification of streams and measurement of discharge of a stream by Area – Slope and Area – Velocity methods. **Hydrograph**: Flood hydrographs and its components, S-Curve Technique, unit hydrograph, synthetic hydrograph.	9
IV	**Statistical Methods**: Statistics in hydrological analysis, Various methods of averages. Probability of an event, Frequency analysis, time series. **Floods**: Causes and effects, Factors affecting peak flows and its estimation, Flood routing and Flood forecasting.	9
V	**Groundwater**: Introduction, Occurrence and distribution of Groundwater, Water table, Aquifers, Ground water exploration, Electrical resistivity method, Darcy's law. Introduction to hydraulics of wells, Open wells – yield test.	9

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Text Books:

1. S. K. Garg,Hydrology and water resources Engineering, Khanna Publishers.
2. M. J. Deodhar, Elementary Engineering Hydrology, Pearson Education, Edition 2009.

Reference Books:

1. Raghunath H.M, Hydrology, Wylie Publication, 1996.
2. Chow Ven Te, Maidment R David, Mays W Larry, Applied Hydrology, McGraw-Hill New Delhi, 1998.
3. Subramanya K, Engineering Hydrology, Tata McGraw-Hill, New Delhi, 1996.

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V Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC507

Title of Course: Geotechnical Engineering Laboratory

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
--	--	2	2	1	--	25	25	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Perform*** various laboratory experiments to determine physical and index properties of soil and classify soil as per IS codal provisions.

CO2 ***Determine*** the permeability of soils by various laboratory tests.

CO3 ***Perform*** laboratory test to determine the maximum dry density and optimum moisture content of the soil.

CO4 ***Perform*** various shear strength tests and determine shear strength parameters suitable to the different field conditions.

Minimum Eight (8) experiments to be performed from the list/topics given below:

Sr. No	List of Practical
1.	Determination of moisture content by Oven Dry method.
2.	Determination of Specific gravity of soil (Pyconometer, Density bottle).
3.	Grain size analysis of soil (Sieve Analysis).
4.	Determination of Atterbergs Limits.
5.	Determination of Permeability by constant head and falling head.
6.	Determination of Compaction characteristics of soil by Proctor compaction test.
7.	Determination of field density by core cutter method.
8.	Determination of field density by sand replacement method.
9.	Determination of Shear parameters of soil by unconfined compression test.
10.	Determination of shear parameters of soil by direct shear test.
11.	Determination of swell value of soil.
12.	Demonstration of Triaxial shear test.

Text Books:

1. GopalRanjan and A .S. Rao, "Basic and Applied Soil Mechanics", G. K. Publications pvt. Ltd
2. V. N. S. Murthy, "Soil Mechanics and Foundation Engineering", B.S.Publications (3 rd Edition)
3. B. C. Punmia, "Soil Mechanics and Foundation Engineering", Laxmi Publishing Co., New Delhi

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GONDWANA UNIVERSITY, GADCHIROLI

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V Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC508

Title of Course: Water Supply Engineering-LAB

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	ESE	Total
--	--	2	2	1	--	25	25	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Analyze*** physical, chemical and biological characteristics of water and waste water.

CO2 ***Quantify*** the dosage requirement for coagulation process.

CO3 ***Study*** about oxygen demand of water.

CO4 ***Understand*** the impact of water and waste water treatment on people and environment.

Minimum Eight (8) experiments to be performed from the list/topics given below:

Sr. No	List of Practical
1.	To determine the pH value of a given sample of water.
2.	To find the Turbidity of a given sample of water using Jackson's Turbidity meter.
3.	To determine the conductivity of given sample of water.
4.	To fine out the concentration of chlorides in the given sample of water.
5.	To determine the amount of dissolved oxygen (D.O.) in the given sample of water.
6.	To determine the amount of suspended solids (SS), dissolved solids (DS) & total Solids (TS) in a given sample of water.
7.	To Estimate the hardness of the given sample of water by EDTA method.
8.	To determine residual chlorine in a given sample of water.
9.	To determine available chlorine percentage on a given sample of bleaching powder.
10.	To determine Acidity & Alkalinity of given water sample.

Text Books:

1. Environmental Engg (vol 1 & 2) by B.C.Punmia, Laxmi Publication
2. Environmental Engg. (Vol. 1&2) by S.K.Garg.
3. Environmental Engg.by Birdee, Dhanpat Rai and Sons, 1996.

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V Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC509-A

Title of Course: (Program Elective –I) TRANSPORTATION ENGINEERING –I- LAB

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	ESE	Total
--	--	2	2	1	--	25	25	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Understand*** basic concepts of highway material testing.

CO2 ***Decide*** the suitability of Coarse Aggregates and Bitumen for Road construction.

CO3 ***Determine*** CBR value and using it in the design of flexible pavement.

Minimum Eight (8) experiments to be performed from the list/topics given below:

Sr. No	List of Practical
1.	Sub grade soil: CBR test.
2.	Sub grade soil: AASHO Classification (Group index).
3.	Aggregates: crushing value test, Los Angeles abrasion value test, and shape test. (Elongation index, flakiness index) and Soundness test and Water absorption test.
4.	Sieve analysis of aggregates for GSB, WBM, and WMM.
5.	Bitumen: Softening point test
6.	Bitumen: Flash and fire point test.
7.	Bitumen: Specific gravity.
8.	Bitumen: Adhesion Test.
9.	Bitumen: Penetration value.
10.	Bitumen: Ductility Test
11.	Short Field Visit.

Text Books:

1. Highway Engineering Khanna and Justo Nem Chand.
2. Bridge Engineering by S.P.Brindra Dhanpat Rai Publication.
3. Bridge Engineering by S.C.Rangwala Charotar Publishing House Ptv.

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GONDWANA UNIVERSITY, GADCHIROLI

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V Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC509-B

Title of Course: (Program Elective –I) HYDROLOGY - LAB

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	ESE	Total
--	--	2	2	1	--	25	25	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Understand*** and apply different methods for measuring precipitation, evaporation, infiltration.

CO2 ***Determine*** runoff and stream flow using emperical formulas and discharge measurement techniques.

CO3 **Analyze** rainfall data using graphical and statistical methods for hydrological design.

Minimum Eight (8) experiments to be performed from the list/topics given below:

Sr. No	List of Practical
1.	To measure rainfall by using rain gauge.
2.	To determine evaporation losses.
3.	To determine infiltration rate and capacity
4.	To determine runoff by using rational method
5.	To measure discharge by velocity area method.
6.	To estimate ground water table.
7.	To determine soil moisture content.
8.	To estimate evapotranspiration.
9.	To measure hydraulic conductivity.
10.	To study of effect of rainfall intensity on runoff and infiltration.

Text Books:

1. S. K. Garg, Hydrology and water resources Engineering, Khanna Publishers.
2. M. J. Deodhar, Elementary Engineering Hydrology, Pearson Education, Edition 2009.

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GONDWANA UNIVERSITY, GADCHIROLI

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VI Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC602

Title of Course: Design of Steel Structure –Theory

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to

CO1 ***Assimilate*** about the structural steel as a material, structural behavior of steel structural elements & design philosophies for design of steel structures.

CO2 ***Analyze*** and design welded/ bolted connections with detailing as per relevant IS codes.

CO3 ***Analyze*** and design tension members, compression members, column splicing with detailing as per relevant IS codes.

CO4 ***Analyze*** and design simple beams laterally restrained & laterally unrestrained with detailing as per relevant IS codes.

Unit	Content	Hours
I	**Introduction**: Steel as a structural material, various grades of structural steel properties, various rolled steel sections (including cold formed sections, structural pipe (tube) sections) and their properties. Introduction to I. S. 800, 808, 816, 875. etc. Design of axially loaded members: (a) Tension members, (b)Compression members **Design of roof truss**: Load assessment for DL, LL and WL.	9
II	**Design of simple and built-up beams**: Laterally restrained and unrestrained, (symmetrical as well as unsymmetrical section). Introduction to plastic analysis of simply supported beam.	9
III	Design of **welded and riveted plate girder**, design of various stiffeners, design of gantry girder.	9
IV	Design of **single rolled steel column** section subjected to axial load and uniaxial and biaxial moment Design of axially loaded built up columns. Laced and battened columns for various types of loads.	9
V	**Structural Fasteners:** A. Behavior of bolted and welded connections (types, Designations, properties, permissible stresses), failure of bolted and welded joints. Strength of bolt and strength of weld. Efficiency of joints. Design of simple bolted and welded connections. Moment resistant bolted and welded connection. (bending and torsion) B. Design of connection: Beam to beam, beam to column: framed connection. Design of column bases, slab base, gusseted base.	9

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Reference Books:

1. Limit State Design of Steel Structures by S. K. Duggal.
2. Limit State Design of Steel Structures by Subramanian.
3. Limit State Design of Steel Structures by B. C. Punmia, A. K. Jain.
4. IS 800:2007, Steel tables, IS 875

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VI Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC603

Title of Course: DESIGN OF RC STRUCTURES

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to

CO1 ***Recognize*** general structural behavior of RCC structural elements.

CO2 ***Analyze and design*** one way slab, two-way slab and dog legged staircase slab with detailing of reinforcement as per relevant IS codes

CO3 ***Analyze*** and design pre-stressed concrete member.

CO4 ***Design*** column with footing subjected to axial load as per relevant IS codes.

Unit	Content	Hours
I	**Introduction to the Working Stress Method of RCC design.** Basic concepts in a Design for flexure, assumptions, design constants Analysis of the rectangular Section, Balance, under-reinforced and over-reinforced sections. Drawbacks and limitations of Working stress method, shear reinforcement. Design of singly reinforced, doubly reinforced beam and T-beam by WSM	8
II	**Introduction to Limit State Design**: Concept of probabilistic design and limit State design. Characteristic values, partial safety factors, stress strain Relationship stress block parameters, failure criteria, types and properties of Reinforcement, limit state of serviceability and limit state of collapse. Other Limit states. Review of IS – 456-2000. **Limit state of Collapse in Shear & Bond**: Design of beam for shear, shear Span, post cracking resistance, shear mechanism approach, shear failure modes and collapse loads, interaction of shear, flexure and axial force, Check for development length. Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular section. Doubly reinforced rectangular section. Balance failure mode, primary tension failure mode and Primary compression failure mode.	8
III	**Limit state of Collapse in Flexure** - Analysis & Design of the Tee & L-beam Section. Limit state of collapse in compression: Analysis & design of short axially Loaded column. Columns subjected to uniaxial bending, development and use of interaction Curves. Unsupported length, End condition. Introduction to long columns. **Limit state of Serviceability** (i) Causes and control of cracking: Crack in plastic concrete at early age, Cracks due to temperature and shrinkage, restrain induced Cracks, Cracks due to loading. Needs for crack width control.	12

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	(ii) Moment curvature relationship; deflection control of beams and One Way slabs. (no numerical calculation). (iii) Deflection control, calculation of deflection for simply supported beams acceptance criteria need of deflection control.	
IV	**Working Stress Method** - Design of **circular water tank** with roof slab/ dome resting on ground by IS code method. Design of rectangular water tank with one-way roof slab resting on ground by IS code method. **Prestressed Concrete** - Properties of high-grade materials, concepts of Prestressed concrete, methods of prestressing, losses in prestressing. Various systems for prestressing with particular reference to Freyssined Magnel Blatton and Gifford Udall systems. Analysis of rectangular, T and I Section.	10
V	**Limit Stress Method** - Design of one-way, simply supported, single span and cantilever slabs, and Continues slab/ beam with IS coefficients. Design of rectangular pad/ slopped footing for axial load. Design of Dog-legged and open well staircases.	7

Text Books:

1. Reinforced concrete structures- S.N.Sinha
2. Limit State Design of RCC Structuresby A.K. Jain, B.C.Punmiya
3. Limit State Design of RCC Strucutres: Based on IS : 800-2007 – Ashok K. Jain

Reference Books:

1. IS 456 – 2000, IS 875-1 , IS 3370 : Part IV.
2. IS 1343:2012: Prestressed concrete- Code of Practice.
3. Reinforced Concrete Structures by N. Krishna Raju

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GONDWANA UNIVERSITY, GADCHIROLI

(MIDC Road Complex, Gadchiroli-442605)

VI Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC604

Title of Course: Estimation and Costing –Theory

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
				2					

Course outcomes:

After completing the course, the students will be able to

CO1 ***Prepare*** quantity estimates for buildings and other Civil Engineering structures as per Specifications.

CO2 ***Draft*** detailed specifications and work out rate analysis for all works related to Civil engineering projects.

CO3 ***Ascertain*** the quantity of materials required for Civil engineering works as per specifications.

CO4 ***Prepare*** cost estimate and valuation of civil engineering works.

Unit	Content	Hours
I	**Introduction**: (a)Importance, purpose of quantity estimate, Mode and unit of measurement as per I.S.1200. Method and stages of estimates. Item of work and Description of an item of work. Approximate estimation of Civil Engineering works. (b)Proposal and Development of project, Nature of contract between owner &Architect/Engineer, Duties & liabilities of Architect/Engineer, Architect/Engineers normal professional services, various important terminology required like work charge establishment, muster roll, contingencies, cent age charges, measurement book, overheads.	10
II	**Quantity & cost estimates**. Methods of detailed estimates, forms used for detailed estimates, working out the quantities of various materials required for construction of Building.	10
III	**Specifications**: Purpose & principles of specifications. Types of specification, Developing detailed specifications of important items. **Cost Build up**: purpose & principles, Importance of Current schedule rates (CSR) in cost estimate, factors affecting analysis of rates. Task work, factors affecting task work, Markets rates escalation.	6
IV	**Valuation:** Purpose of valuation, Factors affecting value of property price & cost, market	4

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	value, potential value, sentimental value, scrap value, reversionary value etc.	

Text Books:

1. Estimation & Costing by B.N.Dutta UBS Publications Distribution (P) Ltd
2. Estimation & Costing (civil) by D.D.Kohli & Ar.R.C.Kohali(S.chand& company pvt.ltd.)
3. Estimating construction costs by Robert L.Peurify&GaroldD.Oberlender , Tata McGraw-Hill

Reference Books:

1. Estimation & Costing and Valuation by Rangwala Charotar Publictaion.
2. Estimation & Costing by G.S Birdie Dhanpat Rai Publictaion.

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GONDWANA UNIVERSITY, GADCHIROLI

(MIDC Road Complex, Gadchiroli-442605)

Course Code: STPECCEC605-A

Title of Course: (Program Elective –II) Industrial Waste Water Treatment

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to

CO1 ***Understand*** importance of Industrial Wastewater Treatment.

CO2 ***Understand*** the fundamentals of various treatment processes.

CO3 ***Understand*** treatment methodologies for various industrial wastewaters.

CO4 ***Design*** various treatment units for industrial wastewater.

Unit	Content	Hours
I	**Introduction:** Environmental impact due to industrial water pollution, problems associated with industrial waste water, and characterization of industrial wastewater. Sampling and analysis of wastewater, toxicity testing, statistical analysis of data, Indian standards for waste disposal	9
II	**Recycle and Reuse of Wastewater:** Common effluent treatment plant. Recycle and reuse of industrial waste, volume and strength reduction, concept of zero liquid discharge.	9
III	**Preliminary Treatment Unit**: Equalization and proportioning of wastewater, design of equalization tank. Neutralization of wastewater, Oil and grease removal, Floatation.	9
IV	**Biological Treatment: Ponds**-Stabilization Pond, Oxidation ponds. **Anaerobic Treatment -** Anaerobic Treatment, UASB, attached growth processes	9
V	**Treatment of Industrial Wastewater:** Treatment of specific industrial wastes: textile, dairy, tanning, sugar, brewery and distillery, iron and steel, food industries.	9

Text Books:

1. Metcalf and Eddy, Wastewater Engineering, Treatment, Disposal and Reuse, Inc.Third Edition McGraw Hill
2. W.W. Eckenfelder, Industrial Pollution Control, McGraw Hill .

Reference Books:

1. Central Pollution control board, India, comprehensive industry document series.
2. World Bank Group (1998) "Pollution Prevention and Abatement Handbook- Towards Cleaner Production" World Bank and UNEP, Washington D.C.

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VI Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPECCEC605-B

Title of Course: (Program Elective –II) Environmental Pollution and Control

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total

Course outcomes:

After completing the course, the students will be able to

CO1 ***Classify*** air pollutants and explain their effects on human, animals, plants, and materials.

CO2 ***Analyze*** meteorological factors affecting air pollution and apply pollutant sampling techniques.

CO3 ***Explain*** control methods of air pollutants, automobile exhaust treatment and noise pollution management.

CO4 ***Classify*** solid waste, study its characteristics and apply suitable methods.

CO5 ***Identify*** water pollutants, analyze waste water characteristics and suggest treatment and prevention strategies.

Unit	Content	Hours
I	Introduction to air pollution, air pollution episodes, atmosphere and its zone, classification of air pollutants with their sources, effects of air pollutants on man, animals, plants and materials.	10
II	Meteorological parameters affecting air pollution, lapse rate and atmospheric stability, plume behavior, wind rose, pollution rose, estimation of stack height, greenhouse effect, atmospheric ozone depletion. Ambient air sampling, stack sampling, collection of particulate and gaseous pollutants.	10
III	Air pollution control: Principles of control methods for particulates and gaseous pollutants control of air pollutants by using various equipment's. Automobile exhaust: pollutions due to diesel and petrol engines exhaust treatment and abatement. Noise pollution: Sources, ill effects, control measures.	10
IV	Introduction to solid waste management. Classification, sources, components, quantity and per capita contribution of solid waste. Physical and chemical characteristics, sampling and analysis of solid waste. Solid waste disposal by composting: Principles, methods of composting, factors affecting composting. Solid waste disposal by sanitary land filling: site requirement, methods, leachate management. Solid waste disposal by incineration: Principles, types, merits and demerits	10
V	Water pollution: sources and types of water pollutants, effects on aquatic life and humans, characteristics of waste water, treatment methods: primary, secondary, and tertiary. Prevention Strategies- wastewater reuse, rainwater harvesting, zero liquid discharge.	6

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Text Books:

1. Air pollution by M. N. Rao and H. V. N. Rao, (Tata McGraw Hill publications)
2. Environmental Pollution Control Engineering by C. S. Rao, (Wiley Estern Ltd.)
3. Air Pollution, NEERI Manual

Reference Books:

1. B.C.Punmia and A.K.Jain wastewater engineering Laxmi Publications.
2. C.S.Rao Environmental Pollution Control Engineering, Wiley Eastern

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GONDWANA UNIVERSITY, GADCHIROLI

(MIDC Road Complex, Gadchiroli-442605)

VI Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPECCEC606-A

Title of Course: (Program Elective –III) Pavement Design.

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to

CO1 ***Describe*** various design parameters required for analysis and design of pavements.

CO2 ***Describ***e various material characteristics required for analysis and design of pavements

CO3 ***Apply*** design parameters and material characteristics for analysis and design of flexible pavements.

CO4 ***Apply*** design parameters and material characteristics for analysis and design of rigid pavements.

Unit	Content	Hours
I	**General**: Pavement design factors, components of flexible and rigid pavement and their functions, characteristics of highway and airfield pavement. Design parameters: Design wheel load, Standard axle load and wheel assemblies for road vehicles. Under carriage system for aircraft, type and contact pressure, contact area, imprints, computation of ESWL for flexible and rigid pavements. Load repetitions and distributions of traffic for highway and aifield, pavement, airport traffic areas, Serviceability concept.	7
II	**Material characteristics**: AASHO subgrade soil classification, CBR test, North Dakota cone bearing value, plate load test for K-value, modulus of elasticity and Poisson's ratio of subgrade soils, Marshall's method of Bituminous mix design, Surface dressing, Premix carpet, Mix seal surfacing , Semi-dense carpet, Asphaltic concrete, Bituminous Macadam Binder course, Dense Bituminous Macadam Binder course, Modulus of rupture, modulus of elasticity, Poisson's ratio and coefficient of thermal expansion of concrete, Layer equivalent concepts.	9
III	**Analysis of flexible and rigid pavements**: Stress, strain, deflection analysis one layer system by Boussinesq's, Two, three-layer system by Burmister's, and multi layered flexible pavement system. Stress and deflections for rigid pavements due to load and temperature, influence charts, ultimate load analysis joints. Highway Pavement Design: Flexible: North Dakota cone, Design using the latest IRC code, Triaxial (Kansas), AASHTO method of design. Rigid: Design using the latest IRC code, PCA, AASHTO method of design, design of joints and reinforcements.	11
IV	**Airfield pavement design**: a) Flexible: FAA, US Corps of engineering, CBR, Mcleod (Canadian) b) Rigid: FAA, PCA& LCN,definitions of ACN, PCN, LCN. Calculation of LCN value.	9

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	Ultimate load analysis and yield lines pattern method.	
V	**Pavement testing and evaluation**: field density, CBR, plate load test,Pavement Failures in both Flexible Pavement & Rigid Pavement - types and causes, condition surveys and surface evaluation for unevenness, rut depth, profilometers, bump integrators, Benkleman beam deflection study. Strengthening of pavements: design of flexible, composite and rigid overlays for flexible and rigid pavements, repairs, maintenance and rehabilitation of pavements.	10

Text Books:

1. Principles of Pavement Design by H.J.Yoder and Witczak, John wiley and sons.
2. Highway Engineering by Khanna O.P, Justo C.G., ,Nem Chand Publishers
3. Pavement Analysis and Design by Yang H. Huang 2nd Edition, Pearson Education, Inc., Pearson Prentice Hall Company

Reference Books:

1. Airport Engineering by G Venkatappa Rao, Tata McGraw –Hill Publishing Company Ltd.
2. IRC-37(Latest Code) Guide lines for Design of Flexible Pavement.
3. IRC -58-(Latest code) Guide lines for Design of Plain Jointed Rigid Pavement for highways.
4. Specifications for Road and Bridge Works, 1994 (Third Revision)
   Reference Books: Airport Engineering by Khanna and Arora, Nemchand& Brothers.

GONDWANA UNIVERSITY, GADCHIROLI

(MIDC Road Complex, Gadchiroli-442605)

VI Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPECCEC606-B

Title of Course: (Program Elective –III) Foundation Engineering

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	ESE	Total
3	--	--	3	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to

CO1 ***Understand*** the basic properties and classification of soils.

CO2 ***Understand and apply*** appropriate site investigations techniques and soil exploration methods for geotechnical data collection.

CO3 ***Analyze and design*** shallow foundation based on bearing capacity and settlement criteria for various soil conditions.

CO4 ***Understand and design*** deep foundations such as piles and caissons based on load carrying capacity and soil conditions.

CO5 ***Understand*** the types, functions and applications of various retaining structures in civil engineering.

Unit	Content	Hours
I	**Soil mechanics fundamentals**: understanding soil types, characteristics and classification systems. Concepts like effective stress, shear strength permeability and consolidation. Understanding soil pressure exert on retaining structure.	7
II	**Site Investigation** Method of exploration –techniques like boring, drilling and various in-situ Testing methods (SPT, SCPT, PLATE LOAD TEST) are used to asses soil condition. Soil sampling and testing- proper sampling techniques and laboratory testing are essential for determine soil properties.	9
III	**Shallow foundations**-types of shallow foundation, bearing capacity and settlement analysis.	10
IV	**Deep foundation**-types deep foundation, pile load capacity, piles group behavior.	9
V	**Retaining structure** –types of retaining wall (gravity walls, cantilever walls and sheet pile all's are commonly used) Stability analysis (ensuring the stability of retaining structure against overturning, sliding and bearing capacity failure)	10

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Text Books:

1. Advance Foundation Engineering by V.N.S Murthy.
2. Principles of Foundation Engineering by Braja M. Das
3. Soil Mechanics and Foundation Engineering by Dr. K. R Arora

Reference Books:

1. Foundation Engineering by P.C Varghese.
2. Foundation Engineering Handbook Edited by Manjriker Gunaratne.

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GONDWANA UNIVERSITY, GADCHIROLI

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VI Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPCCCEC607

Title of Course: Estimating and Costing: Laboratory

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	ESE	Total
0	0	2	2	1		25	25	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Prepare*** quantity estimates for Buildings and other Civil Engineering structures as per Specifications and current schedule of rates of PWD.

CO2 ***Draft*** detailed specifications and work out rate analysis for items of works related to civil engineering projects.

CO3 ***Determine*** the quantity of materials required for Civil engineering works as per specifications.

CO4 ***Prepare*** cost estimate and valuation of civil engineering works.

Minimum Eight (8) experiments to be performed from the list/topics given below:

Sr. No	List of Practical
1.	Detailed building estimate of load bearing structure & framed structure.
2.	A complete set of contract document including specifications.
3.	Detailed estimate of road work.
4.	Rate analysis of 10 major item of building.
5.	Specification of 10 major item of building.
6.	Valuation & rate fixing.
7.	Calculation of reinforcement in RCC with bar bending schedule.
8.	Study of IS-1200 code.
9.	Site visit to: Study of schedule of rates & comparison with market rates & report by the students

Text Books:

1. Estimation & Costing by B.N.Dutta UBS Publications Distribution (P) Ltd
2. Estimation & Costing (civil) by D.D.Kohli & Ar.R.C.Kohali(S.chand& company pvt.ltd.)
3. Estimating construction costs by Robert L.Peurify&GaroldD.Oberlender , Tata McGraw-Hill

Reference Books:

1. Estimation & Costing and Valuation by Rangwala Charotar Publictaion.
2. Estimation & Costing by G.S Birdie Dhanpat Rai Publictaion.

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GONDWANA UNIVERSITY, GADCHIROLI

(MIDC Road Complex, Gadchiroli-442605)

VI Semester B. Tech.Civil Engineering (NEP 2020)

Course Code: STPECCEC608-A

Title of Course: (Program Elective –II) Industrial Waste Water Treatment- LAB

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	ESE	Total
0	0	2	2	1		25	25	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Understand*** the importance of water quality standards.

CO2 ***Perform*** various physical and chemical test on water sample.

CO3 ***Understand*** various biological test performed on water samples and to performed a few biological tests on water.

Minimum Eight (8) experiments to be performed from the list/topics given below:

Sr. No	List of Practical
1.	Determination of pH in given samples.
2.	Determination of turbidity in given samples.
3.	Determination of hardness in given sample.
4.	Determination of alkalinity in given sample.
5.	Determination of chlorides in given sample.
6.	Determination of optimum coagulant dose in given sample.
7.	Determination of suspended, settleable, volatile and fixed solids in given sample.
8.	Determination of dissolved oxygen and BOD in given sample.
9.	Visit to water treatment plant.

Text Books:

1. Wastewater Engineering: Treatment and Resource Recovery by Metcalf and Eddy.
2. Water supply Engineering by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain.

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GONDWANA UNIVERSITY, GADCHIROLI

(MIDC Road Complex, Gadchiroli-442605)

VI Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STPECCEC608-B

Title of Course: (Program Elective –II) Environmental Pollution and Control- Lab

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	ESE	Total
0	0	2	2	1		25	25	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Operate*** *basic air-quality monitoring instruments and record pollutant concentrations.*

CO2 ***Determine*** *particulate matter and selected gaseous pollutant concentrations using appropriate methods.*

CO3 ***Compare*** *ambient air-quality data with applicable Indian standards and interpret AQI.*

Sr. No	List of Practical
1.	Determination of ambient air particulate matter concentration (PM_{10} and $PM_{2.5}$) using a particulate matter sampler or suitable monitoring instrument.
2.	Determination of sulphur dioxide (SO_2) concentration in ambient air using a standard analytical method.
3.	Determination of nitrogen dioxide (NO_2) concentration in ambient air using a standard analytical method.
4.	Measurement of carbon monoxide (CO) concentration using a portable CO meter or gas analyzer.
5.	Measurement of ambient noise levels and study of their relationship with traffic-related air pollution.
6.	Assessment of Air Quality Index (AQI) from measured or supplied pollutant concentration data and comparison with applicable Indian standards.
7.	Site Visit

Text Books:

1. M. N. Rao and H. V. N. Rao, *Air Pollution*, McGraw-Hill Education, New Delhi.
2. C. S. Rao, *Environmental Pollution Control Engineering*, New Age International Publishers, New Delhi
3. S. K. Garg, *Sewage Disposal and Air Pollution Engineering*, Khanna Publishers.

Reference Books:

1. Maharashtra Pollution Control Board (MPCB), *Ambient Air Quality Monitoring Guidelines and Air Quality Data.*
2. S. P. Singal, *Noise Pollution and Control*, Narosa Publishing House.

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GONDWANA UNIVERSITY, GADCHIROLI

(MIDC Road Complex, Gadchiroli-442605)

VI Semester B. Tech.Civil Engineering (NEP 2020)

Course Code: STPECCEC609-A

Title of Course: (Program Elective –III) Pavement Design Lab

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	ESE	Total
0	0	2	2	1		25	25	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Understand*** basic concepts of highway material testing.

CO2 ***Decide*** the suitability of Coarse Aggregates and Bitumen for Road construction.

CO3 ***Determine*** CBR value and using it in the design of flexible pavement.

Minimum Eight (8) experiments to be performed from the list/topics given below:

Sr. No	List of Practical
1.	Sub grade soil: CBR test
2.	Aggregates: crushing value test, Los Angeles abrasion value test, shape test. (Elongation index, flakiness index) and Soundness test and Water absorption test
3.	Sieve analysis of aggregates for GSB, WBM, WMM
4.	Bitumen: Softening point test.
5.	Bitumen: Flash and fire point test
6.	Bitumen: Specific gravity
7.	Bitumen: Adhesion Test
8.	Bitumen: Penetration value
9.	Bitumen: Ductility Test

Text Books:

1. Highway Engineering Khanna and JustoNem Chand.
2. Bridge Engineering by S.P.BrindraDhanpatRai Publication.
3. Pavement Design: Yoder and WitzakWiley.

Reference Books:

1.IS 2386 Part 1 to 5 for coarse aggregate.
2.IS 2720 Part 16 for CBR Test.

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GONDWANA UNIVERSITY, GADCHIROLI

(MIDC Road Complex, Gadchiroli-442605)

VI Semester B. Tech.Civil Engineering (NEP 2020)

Course Code: STPECCEC609-B

Title of Course: (Program Elective –III) Foundation Engineering Lab

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	ESE	Total
0	0	2	2	1	--	25	25	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Determine*** basic index and engineering properties of soil through standard laboratory tests.

CO2 ***Analyze*** soil strength and classification parameters for geotechnical applications.

CO3 ***Interpret*** test results for use in foundation and pavement design.

Sr. No	List of Practical
1.	Determination of water content of soil by oven drying method.
2.	Determination of dry density of soil by sand replacement method.
3.	Grain analysis of soil.
4.	Determination of liquid and plastic limit of soil.
5.	Liquid limit determination by cone penetrometer.
6.	California bearing ratio (CBR) value test.
7.	Direct shear test.
8.	Standard penetration test.

Text Books:

1. Soil mechanics and foundation engineering- Dr. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain.
2. Soil mechanics and foundations –K.R Arora
3. Geotechnical engineering principles and practices- V.N. S Murthy.

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GONDWANA UNIVERSITY, GADCHIROLI

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VI Semester B. Tech. Civil Engineering (NEP 2020)

Course Code: STVSECCEC610

Title of Course: Design Practice of RC and Steel Structure

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	ESE	Total
0	1	2	2	2	--	50	--	--	50

Course outcomes:

After completing the course, the students will be able to

CO1 ***Design*** RCC structural elements using IS code provisions and LSM.

CO2 ***Design*** steel beams and columns under various loading conditions.

CO3 ***Apply*** IS code methods of water tank and storage structure.

CO4 ***Interpret*** design result for safe and economical structural solutions.

Minimum five (5) experiments to be performed from the list/topics given below:

Sr. No	List of Practical
1.	Design of Water tank by IS Code method (Circular).
2.	Design of one way and two way slab by LSM method.
3.	Design of doglegged staircase by LSM method.
4.	Design of simple beam laterally restrained symmetrical section.
5.	Design of laterally restrained built up beam symmetrical section.
6.	Design of single rolled steel column subjected to axial load.
7.	Design of single rolled steel column subjected to biaxial load.

Text Books:

1. Design of Reinforced Concrete Structures-B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain.
2. Limit State Design of Reinforced Concrete- P.C.Varghese.
3. Design of Steel Structure- S.K. Duggal/N.Subramanian.

Reference Books:

1. IS 456:2000 – Plain and Reinforced Concrete.
2. IS 800: 2007- General Construction in Steel.
3. IS 3370 (Part 1 to 4) : 2009- Code of Practice for concrete structures for storage of liquids.

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