4 year B.Tech. Degree Course
Civil Engineering
Choice Based Credit System
(With effect from the academic year 2020-21)

IV Semester – Scheme & Syllabus

SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING: TIRUPATI-517502

DEPARTMENT OF CIVIL ENGINEERING

R20 Scheme of Instruction effective from the academic year 2020-2021

FOURTH SEMESTER

S.No	Course Code	Category	Course Title	Scheme of Instruction(Hours/Week)				No. of Credits	Scheme of Evaluation		
				Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
1	MA401C	BS	Probability &Statistics *(Common to all branches)*	3	-	-	3	3	40	60	100
2	CE402C	PCC	Concrete Technology	3	-	-	3	3	40	60	100
3	CE403C	PCC	Fluid Mechanics and Hydraulic Machines	2	1	-	3	3	40	60	100
4	CE404C	PCC	Structural Analysis-I	2	1	-	3	3	40	60	100
5	CE405C	PCC	Water Quality and Treatment	3	-	-	3	3	40	60	100
6	CE406C	PCC	Soil Mechanics	2	1	-	3	3	40	60	100
7	CE407P	PCP	Fluid Mechanics and Hydraulic Machines Lab	-	-	3	3	1.5	40	60	100
8	CE408P	PCP	Soil Mechanics Lab	-	-	2	2	1	40	60	100
9	CE409S	SC	Skill Development Course 2	1	-	2	3	2	40	60	100
10	CE410P	PCP	Computer Aided Building Drawing	-	-	3	3	1.5	40	60	100
11	MC411B	BS	NCC/NSS/NSO (60 hrs)	(Grade= Satisfactory/Unsatisfactory)							
12	CEHN1			4	-	-	4	4	40	60	100
	CEMN1			4	-	-	4	4	40	60	100
			Total	**16+4+4**	**3**	**10**	**29 +4+4**	**24+4+4**	**400+40+ 40**	**600+60+60**	**1000+ 100+ 100**

- **Community Service Project(8 Weeks)/Internship 1.5 Months (mandatory) during summer vacation after IV Semester during summer. Performance reflected in V Semester.**
- All undergraduate students shall register for **NCC/NSS/NSO activities** in First semester of B.Tech. A student will be **required to participate in an activity for two hours in a week during second and third semesters i.e., 60 hours. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet** on the basis of participation, attendance, performance and behaviour. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

Category		CREDITS
Professional Core Course/ Professional Core Practical's -PCC/PCP		19.0(R) and 4(HN1),4(MN1)
Engg. Science course	-ESC	03
Skill Oriented Course	-SC	02
	Total Credits	**24.0 (R), 4(HN) and 4(MN)**

R- Regular Program, HN-Honors Course, MN-Minor Course

DEPARTMENT OF CIVIL ENGINEERING

MA 401C PROBABILITY & STATISTICS

Instruction Hours/Week: 3(L)
Credits: 3
Sessional Marks : 40 **End Semester Examinations Marks: 60**

Course Educational Objective (CEOs)

The objective of this course is

1. To familiarize the students with numerical methods of solving the non-linear equations, interpolation, differentiation, integration, and ordinary differential equations.
2. To impart knowledge in basic concepts and few techniques in probability and statistics in relation to the engineering applications.

UNIT- I

SOLUTION TO ALGEBRAIC EQUATIONS: Solution of polynomial and transcendental equations: bisection method, Newton-Raphson method and Regula-Falsi method. finite differences, relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

UNIT- II

NUMERICAL DIFFERENTIATION AND INTEGRATION: Numerical Differentiation, numerical integration- trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Ordinary differential equations-Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations.

UNIT -III

PROBABILITY : Probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous)**,** probability distribution: Binomial - Poisson approximation to the binomial distribution and normal distribution-their properties.

UNIT- IV

TESTING OF HYPOTHESIS: Formulation of null hypothesis, critical regions, level of significance. Large sample tests: test for single proportion, difference of proportions, test for single mean and difference of means.

UNIT -V

SMALL SAMPLE TESTS: Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2/e, Reprint 2012.

References

1. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

Course Outcomes:

At the end of the course students will be able to

1. Evaluate approximating the roots of polynomial and transcendental equations by different algorithms
2. Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations
3. Apply discrete and continuous probability distributions
4. Design the components of a classical hypothesis test infer the statistical inferential methods based on small and large sampling tests

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**2**	**2**	**1**		**1**		**1**			**1**	**1**	**1**
CO2	**2**	**2**	**1**	**1**	**1**		**2**		**1**	**1**	**1**	**1**
CO3	**2**	**1**	**1**		**1**		**1**			**1**	**1**	**1**
CO4	**2**	**2**	**2**	**1**	**1**		**1**			**1**	**1**	**1**

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CE 402C CONCRETE TECHNOLOGY

Instruction Hours/Week : 3(L) **Credits : 3**
Sessional Marks : 40 **End Semester Examinations Marks : 60**

Course objectives:

1) Explain the role of ingredients of concrete and apply this knowledge to mix design philosophy
2) Develop fundamental knowledge in the fresh and hardened properties of concrete
3) Produce the testing methodology to evaluate the properties of concrete during fresh and hardened stage
4) Knowledge on the behaviour of concrete with response to stresses developed.
5) Knowledge on the special concretes and Concreting methods.

UNIT-I

CEMENTS AND AGGREGATES:

General, Manufacture of Portland cement by dry process, Approximate oxide composition limits of OPC, Bogue's compounds, hydration of cement, heat liberation from a setting cement, hardening of cement, structure of hydrated cement, water requirements for hydration.

TYPES OF CEMENTS: Ordinary Portland cement, Rapid hardening cement, Sulphate resisting cement,Portland Slag cement, Quick setting cement, Super sulphated cement, Portland pozzolana cement, air entraining cement, coloured cement, expansive cement, High alumina cement.

AGGREGATES: Classification, source, size and shape texture and influence of texture on strength, specific gravity of aggregates, moisture in aggregates, bulking of fine aggregate, methods used for determination of moisture content of aggregates, grading of aggregates, sieve analysis, standard grading curve, grading limits of fine aggregates as per IS ; gap grading.

UNIT-II

WATER & ADMIXTURES: Quality of water for mixing concrete, Tolerable concentrations of some impurities in mixing water, permissible limit for solids as per IS456-2000, use of sea water for mixing concrete.

ADMIXTURES AND CONSTRUCTION CHEMICALS: General, plasticizers and super plasticizers – Dosage, mixing procedure, equipment, effect of super plasticizes on the properties of fresh and hardened concrete, Retardors, accelerators. Air-entraining admixtures, effect of air-entrainment on the properties of concrete, fly ash, effect of fly ash on fresh and hardened concrete, high volume fly ash concrete, silica fume, available forms, effect of silica

fume on compressive strength of concrete, construction chemicals for curing, construction chemicals for water proofing.

UNIT-III

FRESH CONCRETE:

Workability, factors affecting workability, slump test, Kelly ball test, V-B test, compaction factor test, segregation, bleeding, volume batching and weigh batching, hand mixing, machine mixing, mixing time, compaction of concrete, hand compaction, compaction by vibration, internal vibrator, form work vibrator, table vibrator, platform vibrator, surface vibrator.

UNIT-IV

HARDENED CONCRETE: General, water-cement ratio; gel/space ratio; gain of strength with age; maturity concept of concrete

TEST ON HARDENED CONCRETE: Compression test; moulds and compacting; curing; failure of specimen under compression; effect of height/diameter ratio on strength; flexural strength of concrete; tensile strength of concrete

ELASTICITY, CREEP AND SHRINKAGE: Elastic properties of concrete, modulus of elasticity of concrete. Factor's affecting modulus of elasticity, Poisson's ratio, creep and factors affecting creep, shrinkage and factors affecting shrinkage.

DURABILITY OF CONCRETE: Factors contributing to cracks in concrete, sulphate attack and methods of controlling sulphate attack, chloride attack, corrosion of steel and its control.

UNIT-V

SPECIAL CONCRETES AND CONCRETING METHODS: Fibre reinforced concrete; Fibres used, factors effecting properties, aspect ratio of fibres, orientation of fibres, workability, mixing, applications, current development in FRC.

NO-FINES CONCRETE: mix proportion, drying shrinkage, Thermal conductivity, applications.

Ferrocement: Casting techniques, hand plastering, semi-mechanized process, Centrifuging, guniting, applications.

LIGHT-WEIGHT CONCRETE: Natural and artificial light-weight aggregates, properties of common light-weight concretes.

READY MIXED CONCRETE: Batching of aggregates, cement, water, mixing of RMC, Time of transit, Use of admixtures, Pumping of concrete

TEXT BOOK

1. Concrete Technology by M.S.Shetty, S.Chand & Company Pvt. Ltd., New Delhi

REFERENCE BOOKS

1. Properties of concrete by A.M.Neville, Longman Publishers
2. Concrete technology by M.L.Gambhir, Tata McGraw-Hill Publishing company Ltd., New Delhi.

Course Outcomes:

At the end of the course student is able to:

1. Understand various ingredients of concrete and their role.
2. Examine knowledge on the fresh and hardened properties of concrete.
3. Design concrete mixes using various methods.
4. Perceive special concretes for accomplishing performance levels.

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**1**	**2**						**1**				
CO2		**2**	**1**	**2**			**2**	**1**		**1**	**1**	
CO3	**2**	**2**	**1**	**1**			**1**	**1**		**1**	**1**	**1**
CO4		**2**	**1**	**1**		**1**		**1**		**1**	**1**	**1**

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CE403C FLUID MECHANICS AND HYDRAULIC MACHINES

Instruction Hours/Week : 2(L) +1(T) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks: 60

Course Educational Objective (CEOs)

1. To understand the significance of fluid properties.
2. To apply the knowledge of fluid flow concepts and fundamental equations.
3. To solve the problems related to impacts of jets and flow measurements.
5. To apply the knowledge of laminar and turbulent flows.
6. To design the characteristics of turbines and pumps.

UNIT – I
FLUID PROPERTIES
Definition of a fluid –Density, Specific weight, Specific volume, Specific gravity – Viscosity – Bulk modulus of elasticity – Vapour pressure – Surface tension and capillarity- Pressure at a point – Absolute and gauge pressures

FLUID STATICS
Pascal's law – Pressure measurement – Manometers- Mechanical gauges – Hydrostatic pressure and force: horizontal, vertical and inclined planes, Curved surfaces.

UNIT – II
FLUID FLOW CONCEPTS
Flow characteristics – Velocity – Acceleration – Types of flow – Streamlines, Path lines, Streak lines – Stream function, Velocity potential, flow-net – Circulation and Vorticity.

FUNDAMENTAL EQUATIONS
Continuity equation – Energy Equation - Euler's equation of motion along a streamline – Bernoulli's equation – Applications of Bernoulli's Equation – Free jets and vortex flows.

UNIT III
IMPACTS OF JETS
Linear momentum equation - Impacts of jets on free and fixed moving vanes – Moment of momentum equation.

FLOW MEASUREMENT
Velocity measurement – Pitot tubes – Flow measurements: Flow through pipes- Venturi meter, Orifice meter and Nozzle meter- Flow through Channels: Weir and notches – Flow through tanks: Orifice and Mouth pieces.

UNIT IV
LAMINAR FLOW
Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity.

TURBULENT FLOW
Reynolds experiment, Transition from laminar to turbulent flow, Definition of turbulence, scale and intensity, Causes of turbulence, Turbulent flow in pipes. Reynolds stresses,

semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes,

UNIT V

HYDRAULIC TURBINES

Classifications of turbines – Pelton Wheel, Francis Turbine and Kaplan Turbine velocity triangles at inlet and outlet – work done and efficiency– Draft Tube theory- Specific Speed – Characteristic Curves .

CENTRIFUGAL PUMPS

Components – Working – Types – Workdone – Heads – Losses and Efficiencies – Specific Speed – Multi Stage Pumps – Performance Characteristic Curves – Net positive Suction Head (NPSH).

Course Outcomes (COs)

After completion of the course the student will be

1. Able to solve fluid flow problems using fundamental principles
2. Able to apply the knowledge of fluid flow concepts and fundamental equations for solving problems
3. Able to measure pressure, velocity and discharge, and apply the knowledge of impacts of jets related to real life problems.
4. Able to analyze the flow problems in laminar and turbulent flow conditions.
5. Able to analyze the characteristics of turbines and pumps.

TEXT BOOKS

1. Hydraulics and Fluid Mechanics including Hydraulic Machines by P.N. Modi and S.M. Seth – Twentieth edition 2015, Standard Book House , New Delhi.
2. Fluid Mechanics and Hydraulic Machines by R.K.Rajput - 2002 Publication, S.Chand & Company Ltd., New Delhi.
3. Fluid Mechanics and Hydraulic Machines by R.K.Bansal -Revised Ninth edition 2010, Laxmi Publications (P) Ltd., New Delhi.

REFERENCE BOOKS

1. Fluid Mechanics by Victor L. Streeter and E.Benjamin Wylie, Keith W. Bedford – Edition 2010, Tata Mc Graw Hill Education Private Limited, New Delhi.
2. Fluid Mechanics and Turbo machines by Madan Mohan Das. – First Edition 2009, PHI Learning Pvt.Ltd., New Delhi.

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**2**	**1**	**2**	**2**	**2**					**2**	**1**	**1**
CO2	**1**	**2**	**2**	**2**	**2**					**2**	**1**	**1**
CO3	**2**	**1**	**2**	**2**	**2**					**2**	**1**	**2**
CO4	**2**	**2**	**2**	**2**	**1**					**1**	**1**	**1**
CO5	**2**	**2**	**2**	**1**		**1**				**1**	**1**	**2**

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CE 404C STRUCTURAL ANALYSIS-I

Instruction Hours/Week: 2(L)+1(T) **Credits : 3**
Sessional Marks : 40 **End Semester Examinations Marks : 60**

Course Objectives

1) To impart the principles of elastic structural analysis and deflection behavior of structures.
2) To impart knowledge about various methods involved in the analysis of determinate structures and indeterminate structures
3) To study the torsional effect and power transmission and to analyze various types of springs
4) To make the student familiar with moving loads on bridges

UNIT- I

DEFLECTIONS: Relationship between curvature, slope and deflection - Differential equation for the elastic line of a beam - Slope and deflection of cantilevers and simply supported beams under point loads, Uniform distributed load, Uniformly varying load by integration method (Macaulay's method),moment area method (Mohr's theorem) and conjugate beam method.

UNIT-II

TORSION OF CIRCULAR SHAFTS: Theory of pure torsion in solid and hollow circular shafts - Transmission of power - Combined bending, torsion and end thrust.

SPRINGS: Types of springs - Close and open coiled helical springs under axial loads and axial couple - springs in series and parallel - Carriage or leaf springs.

UNIT- III

ENERGY THEOREMS: Virtual work and energy principles - Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear force – Maxwell's theorem– Betti's theorems–Castigliano's first theorem and unit load method – Deflection of simple pin jointed trusses.

UNIT- IV

INDETERMINATE STRUCTURES: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Analysis of plane trusses with two degrees of internal and external indeterminacy – Castigliano's theorem–II – Lack of fit–Analysis of propped cantilever beams under UDL and point loads.

UNIT- V

INFLUENCE LINES AND MOVING LOADS:

Influence lines for reactions, BM and SF; Curves of maximum BM and SF for single, two

and multiple loads, UDL longer and shorter than span, enveloping parabolic and EUDL – forces in truss members.

Text Books:

1) Theory of Structures - Vol.I by S.P.Gupta, G.S.Pandit & R.Gupta.
2) Strength of Materials-U.C.Jindal,Pearson Publishers
3) Mechanics of Structures Vol.II by S.B.Junarkar.
4) Structural Analysis by L.S.Negi & R.S.Jangid.

References:

1**.** Intermediate structural Analysis by Wang
2. Fundamentals of Structural analysis by sujith kumar rao & subrata chakrabarty

Course Outcomes:

At the end of the course, students will be able to:
1. Distinguish between determinate and indeterminate structures
2. Analyze determinate and indeterminate structures
3. Use influence line diagram as a valid tool for structural analysis
4. Asses the power transmission of shafts and springs

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**2**	**1**	**2**	**2**	**1**				**1**	**1**	**1**	**1**
CO2	**2**	**2**	**2**	**2**	**1**	**1**	**1**			**1**	**1**	**1**
CO3	**2**	**2**	**2**	**1**	**1**				**1**	**1**	**2**	**1**
CO4	**2**	**1**	**2**	**2**	**2**				**1**	**2**	**2**	**1**

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With effect from the academic year 2020– 2021
IV Semester

CE 405C WATER QUALITY AND TREATMENT

Instruction Hours/Week : 3(L) **Credits : 3**
Sessional Marks : 40 **End Semester Examinations Marks : 60**

Course Educational Objective (CEOs)

1. To know the water quality of different sources and water demand estimation.
2. To analyze the distribution network
3. To learn about the water quality parameters
4. To know the design concepts of water treatment plant
5. To study the advanced water treatment methods.

UNIT – I

SOURCES AND DEMAND OF WATER: Different sources of water, quantity and quality of different sources, Types and variation in water demand, factors affecting water demand, design period, population forecasting – Different methods and their suitability.

UNIT-II

WATER COLLECTION, CONVEYANCE AND DISTRIBUTION: Intake works for collection of surface water – Conveyance of water – Gravity and pumping – Their design – Different materials used for conveying conduits and their suitability, systems of distribution – Distribution reservoirs – Distribution networks, design of simple and complex pipe networks, pipe accessories – Valves and their location and suitability.

UNIT – III

WATER USES AND QUALITY REQUIREMENTS: Sources of water pollution, water borne diseases. Need for protected water supply, water quality – Physical, chemical and biological characteristics, water quality standards for different uses.

WATER TREATMENT: Conventional water treatment processes units and their functions. Theory and design of aeration, coagulation, flocculation and clarification, Determination of optimum dose of alum for coagulation of water.

UNIT – IV

FILTRATION AND DISINFECTION: Theory of Filtration – Different types of filters and their design. Disinfection – Disinfectant's mechanism of disinfection – Different methods of Disinfection. Types of Chlorination - Break point chlorination.

UNIT – V

ADVANCED TREATMENT METHODS: Treatment methods for removal of fluorides, arsenic, hardness, iron and manganese, salinity, colour.

TEXT BOOKS :

1. Water Treatment Principles and Design by James M. Montgomery.
2. Water Supply Engineering, by S.K.Garg.
3. Environmental Engineering by H.S.Peavy et al.
4. Water Supply and Sewerage, by E.W.Steel.

Course Outcomes (COs)

After completion of the course the student will be:

1. Able to estimate the water demand of any area and understand the water sources and its quality
2. Able to solve the distribution network problems
3. Able to explain the water quality parameters
4. Able to plan and design water treatment plant
5. Able to understand advanced water treatment technologies

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**2**	**2**	**2**	**2**	**1**	**2**	**2**			**1**	**1**	**1**
CO2	**1**	**1**	**2**	**1**	**2**	**1**	**2**			**1**	**1**	**1**
CO3	**2**	**1**	**1**	**1**		**2**	**1**			**1**	**2**	**1**
CO4	**2**	**2**	**2**	**2**	**1**	**2**	**2**			**1**	**1**	**1**
CO5	**2**	**1**	**1**	**1**		**2**	**1**			**1**	**2**	**1**

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CE 406C SOIL MECHANICS

Instruction Hours/Week: 2(L)+1(T) **Credits : 3**
Sessional Marks : 40 **End Semester Examinations Marks: 60**

Course Objectives:

1) To know about types of soils formation and the phase composition for arriving the interrelationships
2) To know the procedures for finding index properties of the soils for identification and classification.
3) To understand the modes of soil water existence & effective stresses principle
4) To understand permeability in soils and concept of seepage analysis
5) To know the principle of Consolidation and compute settlements in soils.
6) To know the methods of determining Shear Strength of soils.

UNIT- I
SOIL COMPOSITION AND PHASE RELATIONSHIPS:

Types of soils - formation and deposition - Phase composition and Soil as 3−Phase system- Weight-Volume parameters: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity - Relationship between various soil parameters - Determination of Moisture content, Specific gravity and Unit weights using various methods.

UNIT -II
IDENTIFICATION AND CLASSIFICATION OF SOILS:

Index properties- Determination of particle size-Dry Sieve Analysis &Sedimentation Analysis- Determination of Consistency limits-liquid limit, plastic limit, shrinkage limit - Indices from Index properties-Density Index, Plasticity, Liquidity and Consistency indices, Flow & Toughness indices - Soil classification based on particle size , texture - Unified and Indian standard soil classification systems – Engineering significance of classification and classification parameters- Tests for field identification of soils

UNIT -III
SOIL WATER & EFFECTIVE STRESS PRINCIPLE:

Mode, Occurrence and types of soil water – Geostatic stresses in soils - capillarity – Total Stress- Pore water pressure- Effective Stress Principle - nature of effective stress, effect of ground level, surcharge &water table on effective stress.

PERMEABILITY & SEEPAGE ANALYSIS:

Darcy's law- coefficient of permeability: determination by constant-head and falling-head methods-Permeability of stratified soils - factors affecting Permeability -Movement of water

through soils- stream and potential functions - flow nets, graphical method to plot flow nets- seepage pressure - quick sand condition.

UNIT- IV

CONSOLIDATION OF SOILS:

Comparison between compaction and consolidation, initial, primary & secondary consolidation - Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.

UNIT – V

SHEAR STRENGTH OF SOILS:

Shear strength of soils - Mohr'-Coulomb Failure Criteria - Measurement of shear strength - Direct shear, Unconfined compression and Tri-axial compression tests - Shear strength parameters - Shear strength of cohesive and cohesion less soils - Test conditions - Stress Paths under different stress conditions.

TEXT BOOKS:

1. C. Venkataramiah, Geotechnical Engineering, New age International Pvt. Ltd, (2002).
2. K. R. Arora, Soil Mechanics and Foundation Engg, Standard Publishers and Distributors, Delhi.

REFERENCES:

1. Gopal Ranjan & A. S. R. Rao, Basic and Applied Soil Mechanics, New age International Pvt . Ltd, New Delhi.
2. Braja M. Das Principles of Geotechnical Engineering, Cengage Learning
3. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundation, Laxmi publications Pvt. Ltd., New Delhi

Course Outcomes:

At the end of the course, the student must be able to:

1. Identify and classify various soils based on their characteristics.
2. Compute effective stresses in soils under different conditions
3. Evaluate permeability and seepage of soils.
4. Understand consolidation in soils and Calculate consolidation time and settlement of soils.
4. Understand shear strength theories and determine Shear Characteristics of soils

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**2**	**2**	**1**	**1**	**1**	**1**					**1**	**1**
CO2	**2**	**2**	**1**	**1**	**1**	**1**		**1**			**1**	**1**
CO3	**2**	**2**	**2**	**2**	**1**	**2**	**1**		**1**		**1**	**1**
CO4	**2**	**2**	**2**	**2**	**2**	**2**	**1**		**1**	**1**	**1**	**1**

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With effect from the academic year 2020– 2021
IV Semester

CE407P FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Instruction Hours/Week : 3(P) Credits : 1.5

Sessional Marks : 40 End Semester Examinations Marks : 60

Course Educational Objective (CEOs)

1. To determine the coefficient of discharge in flow measuring devices.
2. To determine the coefficients of different losses in pipe flow.
3. To draw the performance characteristic curves of pumps.

FLOW MEASUREMENT

1. Calibration of Small Orifice
2. Calibration of Venturimeter
3. Calibration of Orifice meter
4. Calibration of Bend meter
5. Calibration of Triangular Notch

HEAD LOSSES IN PIPES

6. Determination of Friction factor of the pipe material
7. Determination of Head Loss coefficient due to Sudden Contraction
8. Determination of Head loss coefficient due to Gate Valve in a pipe line
9. Determination of Head Loss coefficient due to Bend in a pipe line

HYDRAULIC MACHINES

10. Characteristic curves of 0.8 kW two stage centrifugal pump
11. Characteristic curves of variable speed centrifugal pump

Course Outcomes (COs)

After completion of the course the student will be:

1. Able to calibrate the flow measuring devices.
2. Able to calculate loss coefficients for use in the pipe flow analysis.
3. Able to prepare the characteristic curves of the pumps.

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**2**	**2**	**2**	**1**	**1**	**2**	**1**			**1**	**1**	**1**
CO2	**2**	**2**	**2**	**1**		**2**				**1**	**1**	**1**
CO3	**2**	**2**	**2**	**2**		**1**				**2**	**2**	**2**

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CE408P SOIL MECHANICS LABORATORY

Instruction Hours/week : 2 (P) **Credits :1**

Sessional Marks : 40 **Semester-end Examination: 60**

Course Educational Objective (CEOs)

The course should enable the students to:

1. Know the procedure to determine basic properties of soils in the laboratory.
2. Know the procedure to determine compaction characteristics of soils in the laboratory.
3. Develop laboratory skills to arrive the basic properties and compaction characteristics of soils.

List of Experiments

1.a. Grain Size Distribution by Dry Sieve Analysis.

b. Shrinkage Limit of given soil

2. Grain Size Distribution by Hydrometer Analysis

3.a. Specific Gravity of soil

b. Free Swell Index of soil

4.a. Liquid limit of soil

b. Plastic limit of soil

5.a. In-situ density of soil by Core Cutter method

b. Shrinkage Limit of given soil pat

6. In-situ density by Sand Replacement method.

7. I.S. Light Compaction test/ Standard Proctor Compaction test

Course Outcomes (COs)

After completion of the course the student will be able to:

1. Describe the procedure for determining the basic properties and compaction characteristics of soils.
2. Conduct basic tests and classify the soils for engineering purpose.
3. Conduct I.S. Light compaction test on soils and determine the compaction characteristics for engineering purpose.

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**2**	**2**	**1**			**1**			**1**		**1**	**1**
CO2	**2**	**2**	**2**		**1**			**1**		**1**		
CO3	**2**	**1**	**1**		**1**					**1**		**1**

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CE409S PYTHON PROGRAMMING

Instruction Hours/Week: 1(T) +2(P) **Credits : 2.0**
Sessional Marks : 40 **End Semester Examinations Marks : 60**

Course Educational Objective (CEOs)

1. Computer programming skills are now becoming part of basic education as these skills are increasingly of vital importance for future job and career prospects.
2. The Python programming language which is one of the most popular programming languages worldwide.
3. The course shows you how to use the free open-source Python to write basic programs and high-level applications using concepts such as Class, BIF of Python, functions, variables, If Else statements, For loops, While loops, iterative and recursive programs and algorithms such as the Insertion Sort algorithm.
4. This course will be of great interest to all learners who would like to gain a thorough knowledge and understanding of the basic components of computer programming using the Python language – and might be a gentle introduction to programming for those who think they might have a longer-term interest in the subject area.

UNIT I

Introduction to Python Programming Language: Introduction to Python Language: What is Python? Why Python? Installing Python on Windows, Python IDLE, Python Literals, Python Data Types Basic Input-Output operations, Operators in Python, Decision making in Python, Conditional execution in Python, Logical and bit operations in Python, Naming Conventions, String Operations, String Slices, String Operators, Numeric Data Types, Conversions, Data type conversion, Built in Functions.

UNIT II

Python Built-in Data Structures: Introduction, List, Tuples, Dictionary, Sets, List Operations append, extend, insert, remove, pop, slice, and reverse, List Comprehension, Dictionary operations, Sorting Dictionaries, Copying Collections, Set operations. Standard python modules math, time, IO and time, Regular expressions, multi-threading.

UNIT III

Classes in Python, Principles of Object Oriented programming, Creating Classes, Instance Methods, File Organization, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes.

UNIT IV

Functions, I/O, Exception Handling in Python

Introduction:Defining your own functions, keyword and optional parameters, mapping functions, lambda functions, **Data Streams:** Creating Your Own Data Streams · Access Modes · Writing Data to a File · Reading Data From a File · Additional File Methods · Using Pipes as Data Streams · Handling IO Exceptions · Working with Directories · Metadata · Errors · Run Time Errors · The Exception Model · Exception Hierarchy · Handling Multiple Exceptions

Unit V

Python API development.

Introduction to API, Python API programming, Python web application frameworks, REST API, Python Flask, Flask Environment, Routing, Cookies, Sessions, Running Flask Application, Testing API with POSTMAN client

Course Outcomes (COs)

Upon completion of this course, students should be able to

1. Apply the OOP principles and best practices of python programming.
2. Write clear and effective pythonic code.
3. Create applications using python programming.
4. Implementing databases using SQLite and Access databases using python programming.
5. Understand and feel comfortable in working with web application frameworks.
6. Develop APIs required for the web applications using web frameworks like Flask and Fast API.

Reference Book:

1. Dive into Python, Mike
2. Learning Python, 4th Edition by Mark Lutz
3. Programming Python, 4th Edition by Mark L

Fundamentals of Python Programming, Richard L. Halterman Updated content of the book is maintained under the URL:http://python.cs.southern.edu/pythonbook/pythonbook.pdf

The official Python Tutorial. http://docs.python.org/tut/ How to think like a computer scientist (interactive) http://interactivepython.org/runestone/static/thinkcspy/index.html How to think like a computer scientist http://openbookproject.net/thinkcs/python/english3e/ Code Academy Python http://www.codecademy.com/tracks/python A useful hands-on book: http://anh.cs.luc.edu/python/hands-on/3.1/Hands-onPythonTutorial.pdf

1. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher, Revised and Expanded version (Referred by MIT)
2. Python Programming using problem solving Approach by Reema Thareja, Oxford University, Higher Education Oxford University Press; First edition (10 June 2017), ISBN-10: 0199480173
3. Data Structures and Algorithms in Python by Michael T Goodrich and Robertto Thamassia, Micheal S Goldwasser, Wiley Publisher (2016) Fundamentals of Python first Programmes by Kenneth A Lambert, Copyrighted material Course Technology Inc. 1 st edition (6th February 2009

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**1**			**1**	**2**						**2**	**2**
CO2		**2**			**1**	**2**		**1**			**2**	**2**
CO3	**1**			**2**	**2**					**1**	**2**	**2**
CO4	**1**			**1**	**2**				**1**		**2**	**2**
CO5		**2**			**1**	**2**	**1**				**2**	**2**
CO6	**1**			**2**	**2**			**1**			**2**	**2**

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CE410P COMPUTER AIDED BUILDING DRAWING

Instruction Hours/Week : 3(P) **Credits : 1.5**
Sessional Marks : 40 **End Semester Examinations Marks : 60**

Course Educational Objective (CEOs)

1) Develop parametric design and the conventions of formal engineering drawing
2) Produce and interpret 2D drawings
3) Communicate a design idea/concept graphically/ visually
4) Examine a design critically and with understanding of AUTOCAD software.

UNIT- I
INTRODUCTION: Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, coordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.

UNIT- II
SYMBOLS AND SIGN CONVENTIONS: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards

UNIT- III
MASONRY BONDS: English Bond and Flemish Bond – Corner wall and Cross walls – One brick wall and one and half brick wall

UNIT- IV
BUILDING COMPONENTS: Terms, Doors, Windows, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan.

UNIT- V
TYPICAL BUILDING DRAWINGS: A Building, An Office building, A Dwelling, A Residential House, Plan of a Secondary School, Bank, Primary Health Centre, Duplex House.

It may be advisable to conduct Drawing sessions along with Lab demonstrations.
Text book:
Building Planning and Drawing – Dr. N. Kumaraswamy and A. Kameshwara Rao – CHARATOR PUBLISHING HOUSE**.**

COURSE OUTCOMES:
At the end of the course the student will be able to:
1. Develop drawing skills for effective demonstration of building details.
2. Draw building plans using Computer Aided Design and Drafting soft wares.
3. Develop engineering project drawings incorporating details and design parameters in 2D.
4. Examine efficacy of AUTOCAD design and Drawing.

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**1**			**1**	**2**						**2**	**2**
CO2		**2**			**1**	**2**					**2**	**2**
CO3	**1**			**2**	**2**						**2**	**2**
CO4	**1**	**2**		**2**	**1**	**2**					**2**	**2**

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With effect from the academic year 2020– 2021
IV Semester

CEHN1 HONORS DEGREE COURSE

Instruction Hours/Week : 4(L) **Credits : 4**
Sessional Marks : 40 **End Semester Examinations Marks : 60**

SOIL EXPLORATION AND INSTRUMENTATION

Course Educational Objective (CEOs)

The objective of this course is:

1) To impart knowledge about planning a sub-soil exploration program.
2) To teach methods of exploration and soil sampling.ion.
3) To know the methods of direct and indirect methods of field testing

UNIT- I

GENERAL: Purpose of soil exploration – Planning a sub-surface exploration – Stages in sub-surface exploration – Depth of exploration – Lateral extent of exploration

UNIT- II

OPEN EXCAVATION AND BORINGS OF EXPLORATION: Pits and Trenches – Drifts and shafts – Auger Borings – Wash boring -Rotary drilling - Percussion drilling- Core drilling.

UNIT- III

SOIL SAMPLES AND SAMPLERS: Types of soil samples – Disturbed samples – Undisturbed samples – Design feature affecting the Sample Disturbance – Split Spoon Samplers – Scraper Bucket Samplers Shell by Tubes and Thin walled Samplers – Piston Samlers – Denison Samplers – Hand and curved Samplers

UNIT- IV

IN-SITU TESTING: Standard Penetration Tests – Cone Penetration Tests – In-situ Vane Shear Test – Plate Load Test – Field Permeability Tests – In-situ Tests Using Pressure meter – Observation of Ground Water Table

UNIT- V

GEOPHYSICAL METHODS: Seismic Methods – Electrical Resistivity Methods – Electrical Profiling Method –Electrical Sounding Method-Common Soil Tests-Sub Soil Investigation Report

Course Outcomes:

At the end of the course, the student must be able to:

1. Know the process of the soil exploration.
2. Plan subsurface investigation based on the requirements of civil engineering projects and site conditions.
3. Know the sample collection, preservation and transportation of samples to the laboratory.
4. Know the applications of field test data for geotechnical structures

REFERENCES:

1. Subsurface exploration and sampling of soils for Civil Engineering purposes by Hvorslev, M.J., Waterways Experiment Station, Vicksburg, Mississipi, 1949.
2. Geotechnical Engineering by C. Venkatramaiah, Wiley Eastern Ltd., New Delhi.
3. Foundation Engineering by S.P.Brahma Tata Mc Graw-Hill Publishing Company Limited, New Delhi, 1985.
4. Analysis and Design of Foundations and Retaining Structures by Shamsher Prakash, Gopal Ranjan and Swami Saran, Sarita Prakasham, Meerut, 1979.
5. Relevant I.S. Codes.

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**2**	**2**	**2**	**1**	**1**			**1**			**1**	
CO2	**2**	**1**	**1**	**1**				**1**				
CO3	**2**	**2**	**2**	**1**	**1**						**1**	**1**
CO4	**2**	**2**	**2**	**2**				**2**		**1**	**1**	**1**

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With effect from the academic year 2020– 2021
IV Semester

CEHN1 HONORS DEGREE COURSE

Instruction Hours/Week: 4(L) **Credits: 4**
Sessional Marks : 40 **End Semester Examinations Marks: 60**

DISASTER MANAGEMENT

COURSE OBJECTIVES:

1. To understand basic concepts in disaster management
2. To understand definitions and terminologies used in disaster management
3. To understand types and categories of disasters
4. To understand challenges posed by disasters
5. To understand impact of disasters

UNIT-1

INTRODUCTION: Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation). Application of Geo informatics and Advanced Techniques: Use of Remote Sensing Systems (RSS) and GIS in disaster Management, role of knowledge based expert systems in hazard scenario, using risks-time charts to plan for the future, early warning systems.

UNIT-1I

DISASTERS: Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT-1II

Disaster Impacts Disaster impacts: (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT-1V

Disaster Risk Reduction (DRR) : Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and nonstructural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT-V

Disasters, Environment and Development: Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text/Reference Books:

1. Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill.Pub
2. http://ndma.gov.in/ (Home page of National Disaster Management Authority).
3. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
4. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
5. Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.
6. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation.
7. Disaster Management, R.B. Singh (Ed), Rawat Publications

COURSE OBJECTIVES:

After completion of the course the student will be:

1. To apply the knowledge in mitigating various aspects of environmental hazards
2. To learn and able to find management strategies and governmental action plan in mitigation

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1						**2**	**2**			**1**		**1**
CO2		**2**		**2**		**1**			**1**			

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With effect from the academic year 2020– 2021
IV Semester

CEHN1 HONORS DEGREE COURSE

Instruction Hours/Week: 4(L) **Credits : 4**
Sessional Marks : 40 **End Semester Examinations Marks : 60**

MUNICIPAL SOLID WASTE MANAGEMENT

Course Educational Objectives (CEOs)

1. To study the characteristics and details of solid waste generation
2. To know the elements of solid waste management
3. To learn the processing and recovery techniques of solid waste management
4. To study the design aspects of sanitary landfill
5. To know the aspects of hazardous waste management

UNIT- I

INTRODUCTION : Goals and objectives of solid waste management; Impacts of solid waste generation in a technological society, quantities of solid wastes, future challenges and opportunities.

GENERATION OF SOLID WASTES : Solid waste generation sources; classification of solid waste; data on Indian city wastes; factors influencing generation of solid wastes; characterization and analysis of solid wastes.

UNIT- II

ONSITE HANDLING, STORAGE AND PROCESSING : Public health and aesthetics, onsite handling, methods used at residential and commercial sources; onsite storage dust bins; container locations; onsite processing methods.

COLLECTION : Collection systems, equipment and labor requirements, Analysis of collection systems, collection routes. Transfer stations, transport means and location of transfer stations.

UNIT- III

PROCESSING TECHNIQUES AND EQUIPMENT : Purpose of processing; compaction; Shredding; Incineration and component separation.

RECOVERY OF RESOURCES, CONVERSION PRODUCTS, AND ENERRGY : Material processing and recovery systems, recovery of chemical conversion products, recovery of biological conversion products, recovery of energy from conversion products.

UNIT- IV

DISPOSAL OF SOLID WASTES : Sanitary land fills – General considerations, site selection – operational management systems in land fill – Gas and leachate control – construction; ocean disposal of solid wastes.

UNIT - V

HAZARDOUS WASTES : Sources and Types; Management of Hazardous Wastes-Generation, Storage, Collection, Transfer and Transport, Processing and Disposal; Hazardous Waste Management Rules,2016 :Salient features.

REFERENCE BOOKS :

1. Bhide, A.D. and Sundaresan, B.B. (1983) Solid Waste Management in Developing Countries, INSDOC, New Delhi.

2. Tchobanglous, G.Theisen, H. and Ehasin, R.(1996). Solid wastes engineering principles and Management Issues – McGraw Hill, Tokyo.

Course Outcomes (COs)

After completion of course students will be

1.Able to characterize municipal solid waste and explain about solid waste generation
2. capable of understanding the elements of solid waste management system.
3. Able to apply different solid waste processing and recovery techniques in the management of municipal solid waste
4. Able to plan and design sanitary landfills for municipal solid waste disposal.
5. Able to apply hazardous waste management principles in handling hazardous waste.

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1		**2**		**1**					**1**	**1**		
CO2		**2**		**2**		**1**			**1**			
CO3	**2**	**2**	**2**		**2**							
CO4	**2**	**2**	**2**		**2**			**2**	**1**			
CO5	**2**	**2**	**2**		**2**			**2**	**1**			

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With effect from the academic year 2020– 2021
IV Semester

CEMN1 MINOR DEGREE COURSE

Instruction Hours/Week: 4(L) **Credits : 4**
Sessional Marks : 40 **End Semester Examinations Marks : 60**

BUILDING MATERIALS AND CONSTRUCTION PRACTICES

Course Educational Objective (CEOs):

1. To learn and understand the manufacturing, physical and mechanical properties of various Construction materials and their testing procedures.
2. To study the basic building components.
3. To learn the methods to be followed in constructing various components of a building.

UNIT-I
STONES-BRICKS
Stone as building material-Selection of stones for construction-Tests on stones-Qualities of a good building stone- Deterioration of stones-Preservation of stones.

Bricks-composition of good brick earth-Manufacture of bricks-Classification of bricks-Tests for bricks-Absorption, Crushing strength, Hardness, presence of soluble salts, shape and size, soundness, structure-Uses of bricks-Refractories.

UNIT-II
CEMENT-AGGREGATES
Cement ingredients-Setting action of cement-Manufacturing process of ordinary cement -Types of cement – Field and laboratory tests for cement-storage and uses of cement.

Aggregates-Qualities-classification of aggregates-Testing of Aggregates—Grading of aggregates-classification of sand-Bulking of sand- properties of good sand.

UNIT-III
TIMBER AND OTHER MATERIALS
Timber-Qualities of good timber- Market forms-Industrial timber, Plywood, Veneer-.
Steel -Market forms of steel. Aluminum -properties , alloys of aluminium.

UNIT-IV
CONSTRUCTION ELEMENTS
Types of foundations, Stone Masonry-joints in stone masonry, classification of stone masonry. Brick Masonry-Bonds in brick masonry, types of brick masonry. Lintels- Types of lintels. Roofs and its types. Flooring -types of flooring, timber floors, composite floors. Damp proofing- meaning, causes, effects, materials used for damp proofing, methods of damp proofing.

UNIT-V
OTHER ELEMENTS
Pointing-objects, mortar for pointing, method of pointing, types of pointing. Plastering-requirements of good plaster, methods of plastering. Painting-types of paints, painting on different surfaces failure of paint, defects in painting. Varnishing- characteristics of ideal

varnish, ingredients, types, process of varnishing. Distempering-properties, ingredients of a distemper, process of distempering.
Thermal Insulation - insulating materials, thermal insulation of exposed doors, windows, exposed roofs and exposed walls. Acoustics-definition, types of absorbent materials, conditions for good acoustics, methods of sound insulation.

TEXTBOOKS:

1. Sushil Kumar "Building Materials and construction", 20th edition, reprint 2015,StandardPublishers
2. Dr. B. C. Punmia, Ashok kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications (P) ltd., New Delhi.
3. Rangwala S. C. "Engineering Materials", Charotar Publishing House, India.

REFERENCES:

1. S. K. Duggal, "Building Materials", (Fourth Edition)New Age International (P) Limited, 2016 National Building Code(NBC) of India
2. P C Vergese, "Building Materials", PHI Learning Pvt.Ltd
3. Building Materials and Components, CBRI, 1990,India
4. Jagadish. K.S, "Alternative Building Materials Technology", New Age International,2007.
5. M. S. Shetty, "Concrete Technology", S. Chand & Co. New Delhi.

Course Outcomes (COs):

After completion of the course the student will able to:

1. Explain the manufacturing, physical and mechanical properties of various construction materials and their testing procedures.
2. Describe the basic building components.
3. Apply the methods to be followed in constructing various components of a building.

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**1**		**1**			**1**	**2**		**2**	**1**	**1**	**1**
CO2	**1**		**1**	**1**		**1**	**2**	**1**	**2**	**1**	**1**	**1**
CO3	**2**	**1**	**1**	**1**		**1**	**2**	**1**	**2**	**1**	**2**	**1**

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CEMN1 MINOR DEGREE COURSE

Instruction Hours/Week : 4(L) **Credits : 4**
Sessional Marks : 40 **End Semester Examinations Marks: 60**

THEORY OF STRUCTURES

Course Educational Objective (CEOs):

1. To learn and understand the manufacturing, physical and mechanical properties of various construction materials and their testing procedures.
2. To impart procedure for drawing shear force and bending moment diagrams for beams.
3. To make the student able to analyze flexural stresses in beams due to different loads
4. To understand the general mechanical behavior of reinforced concrete members.
5. To understand the design of structural steel members subjected to compressive, tensile and bending loads, as per current codal provisions (IS800 – 2007)

UNIT-I

CEMENT-AGGREGATES - CONCRETE:
Cement ingredients-Setting action of cement-Manufacturing process of ordinary cement -Types of cement – Field and laboratory tests for cement-storage and uses of cement.

Aggregates-Qualities- classification of aggregates-Testing of Aggregates-Grading of aggregates-classification of sand-Bulking of sand- properties of good sand.

Concrete ingredients – Mixing of concrete –Workability of concrete, Slump cone test - Transportation of concrete – Placing of concrete, Vibration of concrete – Hardened properties of concrete, compressive strength, Split tensile strength and Flexural strength of concrete.

UNIT-II

SHEAR FORCE AND BENDING MOMENT: Definition of beam - Types of beams - Concept of shear force and bending moment - S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads - Point of contraflexure - Relation between S.F, B.M and rate of loading at a section of a beam.

FLEXURAL STRESSES AND SHEAR STRESSES: Theory of simple bending - Distribution of flexural stresses and shear stresses - Resilience due to flexure and shear. Principal stresses and principal strains - Mohr's circle of stresses

UNIT III

COMBENDING STRESSES AND BENDING STRESSES:

Stresses under the combined action of direct loading and B.M - Core of a section - Circular, rectangular and triangular (solid and hollow) - Determination of stresses in the case of chimneys, retaining walls and dams.

COLUMNS AND STRUTS:
Introduction – classification of columns – Axially loaded compression members – Euler's crippling load theory – Equivalent length – Slenderness ratio - Rankine Gordon formula.

UNIT – IV

DESIGN PHILOSOPHIES – working stress method, ultimate load method and limit state method.

LIMIT STATE METHOD:
DESIGN PRINCIPLES: Basic Design Principles - Stress strain curves for concrete and steel - Characteristic strengths and loads - Partial safety factors - Stress block - Various limit states.

DESIGN FOR FLEXURE: Limit state of collapse in flexure - Ultimate flexural strength - Balanced, under-reinforced and over-reinforced sections - Design of singly and doubly reinforced rectangular beams.

DESIGN FOR SHEAR, TORSION AND BOND: Shear-Truss analogy - Design of beams for shear and torsion - Anchorage and development length.

LIMIT STATES OF SERVICEABILITY: Deflection (short and long term).

UNIT – V

INTRODUCTION - Properties of sections - Types of loads - Permissible stresses in tension, compression, and shear as per IS code.

RIVETED AND BOLTED CONNECTIONS - Strength of rivet - Strength of lap and butt joints - Methods of failure and efficiency of a riveted joint - Design of riveted joints - Design of bracket connections

WELDED JOINTS - Types of welded joints - Strength of fillet and butt welds - Design of welded joints - Design of bracket connections ,Design of Tension members - Lug angles.

TEXTBOOKS:
1. Sushil Kumar "Building Materials and construction", 20th edition, reprint 2015,StandardPublishers
2. Mechanics of Structures Vol.I & Vol.II by S.B.Junnarkar.
3. Analysis of Structures by Vazirani & Ratwani.
4. Reinforced Concrete by Limit State Design by AK Jain.
5. Design of Steel Structures – (Limit State Method as per IS 800-2007) by Bhavakatti S.S.

Course Outcomes (COs):
After completion of the course the student will able to:

1. Explain the manufacturing, physical and mechanical properties of various construction materials and their testing procedures.
2. Develop shear force and bending moment diagrams for different load cases
3. Compute the flexural stresses for different load cases and different cross-sections
4. To be in a position to design the basic elements of reinforced concrete structures. Such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice for reinforced Concrete Structures and Design.
5. Ability to design, tension members, compression members and ability to analyze and design of simple bolted and welded connections.

Program Outcomes(PO's) / Course Outcomes (CO's)	PO(1)	PO(2)	PO(3)	PO(4)	PO(5)	PO(6)	PO(7)	PO(8)	PO(9)	PO(10)	PO(11)	PO(12)
CO1	**2**	**2**	**2**	**1**		**1**	**2**	**2**	**2**	**1**	**2**	**1**
CO2	**2**	**1**	**2**		**1**				**2**	**2**	**2**	**1**
CO3	**2**	**1**	**2**	**1**	**1**				**2**	**2**	**2**	**1**
CO4	**2**	**1**	**2**	**1**	**1**				**2**	**2**	**2**	**1**
CO5	**2**	**1**	**2**	**1**	**1**				**2**	**2**	**2**	**1**

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