TITLE OF THE COURSE: ENGINEERING MATHEMATICS – IV B.E., IV Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]	
Subject Code: 21MAT41	CIE: 50
Number of Lecture Hours/Week: 03	SEE: 50
Total Number of Lecture Hours: 40	Exam Hours: 03
CREDITS-03	

Course Learning Objectives:

This course will enable students to:

- Learn Fourier series and Fourier transforms.
- Conversant with numerical methods to solve ordinary differential equations.
- Know then complex combers, Analytic function and associated results and problems.
- Understand Joint probability distribution and stochastic processes arising in science and engineering.
- Understand the definition of sequence, series and its importance.
- Discuss the elementary concepts of graph theory.
- Know the finite difference method and use in solving partial differential equation.

Course Outcomes(COs):

After completion of course, the student will able to

CO#	Course Outcomes	POs	PSOs
CO1	Define the Periodic function and Find the Fourier series and half range series expansion of different functions in different intervals and studying Practical Harmonic functions, Know the use of periodic signals and Fourier series to analyze circuits.	1, 2, 3	
CO2	Learn to solve the problems on Joint probability distribution for two discrete random variables. Knowing the concept of stochastic processes, probability vector, Probability matrix and studying the examples on Markov's chains in discrete time.	1, 2, 3	
CO3	Solving the first order first degree ordinary differential equations arising in flow problems using single step and multistep numerical methods.	1, 2, 3	
CO4	Use to solve second order ordinary and partial differential equations arising in heat and wave equations by numerical methods.	1, 2, 3	
CO5	Apply the knowledge of Fourier transform to solve engineering problems. Understand the analyticity, potential fields, residues and poles of complex potentials in field theory , electromagnetic theory and studying Bilinear transformation./ Obtain the series solution of ordinary differential equations and studying special functions./ Develop the model using advanced concept of graph for real world applications.	1, 2, 3	

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√	√			
CO2	√	√	√			
CO3	√	√	√			
CO4	√	√	√			
CO5	√	√	√			

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1				1			1			
CO2	3	3			1				1			1			
CO3	3	2	2		1				1			1			
CO4	3	2	2		1				1			1			
CO5	3	2	2		1				1			1			

Note: 1-Low, 2-Medium, 3-High

MODULE-1: FOURIER SERIES

Fourier Series: Periodic functions, Dirichlet's condition, Fourier Series of periodicfunctions with period 2π and with arbitrary period $2c$. Fourier series of even and odd functions
Half range Fourier Series, practical harmonic analysis(5 Assignment Problem).
Self-Study: Sequence and series of a function, convergent series.

(RBT Levels: L1, L2 and L3) 8 Hours

Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-2: PROBABILITY DISTRIBUTIONS-2

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient.
Stochastic process: Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability-simple problems.
(5 Assignment Problem).
Self Study : Joint probability distribution for continuous random variable

(RBT Levels: L1, L2 and L3) 8 Hours

Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-3: NUMERICAL METHODS-1

Numerical Methods: Numerical solution of ordinary differential equations of first order andfirst deg ree, Taylor's series method, modified Euler's-method Runge Kutta method of fourth order. Milne's and Adams- Bash forth predictor and corrector methods (No derivations of formulae). (5 Assignment Problem).

Self Study :Picardsmathod

(RBT Levels: L1, L2 and L3) **8 Hours**

Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-4: NUMERICAL METHODS-2

Numerical Methods: Numerical solution of second order ordinary differential equations, Runge-Kutta Method and Milne's Method, Numerical solution of P.D.E: Numerical solution of Heat equation, Wave equation, problems. (5 Assignment Problem).

Self Study :Picard's method, Numerical solution of Laplace's equation

(RBT Levels: L1, L2 and L3) **8 Hours**

Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-5

Department of ECE and EEE : Fourier Transforms and complex variable

Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier-transform (5 Assignment Problem).

Complex line Integrals: Cauchy's Integration theorem, Cauchy integral formula, Laurent's Series, types of singularities. Residue, Poles, Cauchy's Residue theorem (without proof) and Problems.

Transformations: Bilinear transformations and problems.

Self Study : Initial value and boundary value problems

(RBT Levels: L1, L2 and L3) **8 Hours**

Teaching – Learning Process	Chalk and talk method / Power Point Presentation

Department of Civil , Mechanical and Energy Engg : Special Functions

Special Functions: Series solution of Bessel's differential equation leading to $J_n(x)$ −Bessel's function of first kind. Basic properties and orthogonality. Series solution of Legendre's differential equation leading to $P_n(x)$ −Legendre polynomials. Rodrigue's formula, problems

Self Study : Frobenius method

(RBT Levels: L1, L2 and L3) **8 Hours**

Department of CSE : Graph Theory

Graph Theory: introduction to graph theory, definitions of finite and null graphs, loops, multigraphs,

pseudo graph, simple graph, degree of a vertex, isolated vertices, connectedness and complete graph, minimum and maximum degree, regular graphs, subgraphs, walk, trial, paths, Euler and Hamilton graphs.

Self Study : line graphs , Bridge, Block and tree

(RBT Levels: L1, L2 and L3) 8 Hours

Question Paper Pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

CIE + Assignments: 15+35=50 Marks

There will be a 3 CIE's, the average of best of 2 CIE's will be considered and there will be a 35 marks for Assignments

Text Books:

1. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig : Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition,
2. McGraw-Hill Book Co., New York, 1995.
2. James Stewart : "Calculus –Early Transcendentals", Cengage Learning India Private Ltd.,2017.
3. B.V.Ramana : "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Srimanta Pal &Subobh C Bhunia:"Engineering Mathematics", Oxford UniversityPress,3rd Reprint,2016.
5. Gupta C.B., Singh S.R. and Mukesh Kumar : "Engineering Mathematics for Semester I & II", Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math
3. http://academicearth.org.

TITLE OF THE COURSE: STRUCTURAL ANALYSIS – I B.E., IV Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]	
Subject Code: 21CV42	CIE: 50
Number of Lecture Hours/Week: 04	SEE: 50
Total Number of Lecture Hours: 52	Exam Hours: 03
CREDITS – 04	

Course Objectives: This course will enable students to

1. Apply knowledge of mathematics and engineering for calculating slope and deflections of structural elements
2. Identify, formulate and solve engineering problems.
3. Analyze structural systems and interpret data
4. Engage in lifelong learning with the advances in Structural Engineering.
5. To study the Horizontal and Normal thrust and Evaluate Buckling load for columns with different end conditions.

MODULES	**Teaching hours**	**RBT LEVEL**
Module -1 **Introduction and Analysis of Plane Trusses:** Structural forms, Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and non linear analysis, Determinate and indeterminate structures, Types of trusses, Assumptions in trusses, Analysis of determinate trusses by method of joints and method of sections.	**12 Hours**	**L2,L4, L5**
Module -2 **Deflection of Beams:** Definition of slope, Deflection and curvature, Sign conventions, Derivation of moment-curvature equation. Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple.	**10 Hours**	**L2,L4,L5**

Moment area method: Derivation, Mohr's theorems, Sign conventions, Application of moment area method for determinate prismatic beams, Beams of varying section, Use of moment diagram by parts. Conjugate beam method: Real beam and conjugate beam, conjugate beam theorems, Application of conjugate beam method of determinate beams of variable cross sections.		
Module -3 **Energy Principles and Energy Theorems:** Principle of virtual displacements, Principle of virtual forces, Strain energy and complimentary energy, Strain energy due to axial force, bending, shear and torsion, Deflection of determinate beams and trusses using total strain energy, Deflection at the point of application of single load, Castigliano's theoremsandBelti's law, and its application to estimate the deflections of trusses, bent frames.	**10 Hours**	**L2,L4,L5**
Module -4 **Arches and Cable Structures:** Three hinged parabolic arches with supports at the same. Determination of normal thrust, radial shear and bending moment. Analysis of cables under point loads and UDL. Length of cables for supports at same levels	**10 Hours**	**L2,L4,L5**
Module -5 **Analysis of Two Hinged Arches:** Two hinged parabolic arch, Two hinged circular arch. **Columns and Struts:**Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.	**10 Hours**	**L2,L4,L5**

Course outcomes: After studying this course, students will be able to:

1. Evaluate the forces in determinate trusses by method of joints and sections.
2. Evaluate the deflection of cantilever, simply supported and overhanging beams by different methods
3. Understand the energy principles and energy theorems and its applications to determine the deflections of trusses and bent frames.
4. Determine the stress resultants in arches and cables.
5. Determine the Horizontal and Normal thrust and Evaluate Buckling load for columns with different end conditions.

Question Paper Pattern:

• The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
• The question paper will have ten full questions carrying equal marks.
• Each full question carries 20 marks.
• There will be two full questions (with a maximum of four sub questions) from each module.
• Each full question will have sub questions covering all the topics under a module.
• The students will have to answer five full questions, selecting one full question from each module.

CIE + Assignments: 15+35=50 Marks

There will be a 3 CIE's, the average of best of 2 CIE's will be considered and there will be a 35 marks for Assignments

Text Books:

1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.
2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt.Ltd., New Delhi,2015.
3. Bhavikatti, Structual Analysis, Vikas Publishing House Pvt. Ltd, New Delhi, 2002.
4. Dr. D S Rajendra Prasad, Sapna Book house,2015.

Reference Books:

1. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition, 2014
2. Devadoss Menon, Structural Analysis, Narosa Publishing House, New Delhi,2008.
3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd, 2007.

TITLE OF THE COURSE: Hydraulics and Hydraulic machines B.E., IV Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]	
Subject Code: 21CV43	CIE: 50
Number of Lecture Hours/Week: 03	SEE: 50
Total Number of Lecture Hours: 40	Exam Hours: 03
CREDITS – 03	

Course Objectives: The objectives of this course is to make students to learn:

1. Principles of dimensional analysis to design hydraulic models and Design of various models.
2. Design the open channels of various cross sections including design of economical sections.
3. Energy concepts of fluid in open channel, Energy dissipation, Water surface profiles at different conditions.
4. The working principles of the hydraulic machines for the given data and analyzing the performance of Turbines for various design data.

Module -1 **Dimensional analysis:** Dimensional analysis and similitude: Dimensional homogeneity, Non Dimensional parameter, Rayleigh methods and Buckingham pie theorem, dimensional analysis, choice of variables, examples on various applications. **Model analysis:** Model analysis, similitude, types of similarities, force ratios, similarity laws, model classification, Reynolds model, Froude's model, Euler's Model,Webber's model, Mach model, scale effects, Distorted models. Numerical problems on Reynold's, and Froude's Model**.**	**L1,L2,L3** **12 HRS**
Module -2 **Open Channel Flow Hydraulics:** Uniform flow in open channel: Introduction, Classification of flow through channels, Chezy's and Manning's equation for flow through open channel, Most economical channel sections, Uniform flow through Open channels, Numerical Problems.	**L3,L4** **10 HRS**

Module -3 **Non-Uniform Flow:** Specific Energy and Specific energy curve, Critical flow and corresponding critical parameters, Numerical Problems Hydraulic Jump, Applications of hydraulic jump Expressions for conjugate depths and Energy loss, Numerical Problems Gradually varied flow, Equation, Back water curve and afflux, Description of water curves or profiles, Mild, steep, critical, horizontal and adverse slope profiles, Numerical problems,	**L2,L3,L4** **10 HRS**
Module -4 **Hydraulic Machines:** Introduction, Impulse-Momentum equation. Direct impact of a jet on a stationary and moving flat, inclined and curved vanes, Introduction to concept of velocity triangles, impact of jet on a series of curved vanes- Problems **Turbines – Impulse Turbines:** Introduction to turbines, General lay out of a hydroelectric plant, Heads and Efficiencies, classification of turbines. Pelton wheel components, working principle and velocity triangles. Maximum power, efficiency, working proportions.Design problems on pelton wheel.	**L1,L2,L3,L4** **10 HRS**
Module -5 **Reaction Turbines and Pumps:** Radial flow reaction turbines: (i) Francis turbine- Descriptions, working proportions. (ii) Kaplan turbine- Descriptions, working proportions. Draft tube theory and unit quantities. (No problems) Centrifugal pumps: Components and Working of centrifugal pumps, Types of centrifugal pumps, Work done by the impeller, Heads and Efficiencies, Minimum starting speed of centrifugal pump, Numerical problems, Multi-stage pumps.	**L1,L2,L3,L4** **10 HRS**
Course outcomes: After a successful completion of the course, the student will be able to: 1. Apply dimensional analysis to develop mathematical modeling and compute the parametric values in prototype by analyzing the corresponding model parameters 2. Design the open channels of various cross sections including economical channel sections 3. Apply Energy concepts to flow in open channel sections, Calculate Energy dissipation, 4. to calculate the force exerted by jet of water on vanes. 5. Design centrifugal pumps for the given data, and to know their operation characteristics under different operating condition, understanding principles of turbines and its working conditions.	
Question Paper Pattern: • The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50. • The question paper will have ten full questions carrying equal marks. • Each full question carries 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module.	

CIE + Assignments: 15+35=50 Marks
There will be a 3 CIE's, the average of best of 2 CIE's will be considered and there will be a 35 marks for Assignments

Text Books:

1. P N Modi and S M Seth, "Hydraulics and Fluid Mechan ics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi
2. R.K. Bansal, "A Text book of Fluid Mechanics and Hy draulic Machines", Laxmi Publications, New Delhi
3. S K SOM and G Biswas, "Introduction to Fluid Mechan ics and Fluid Machines",Tata McGraw Hill,New Delhi

Reference Books:

1. K Subramanya, "Fluid Mechanics and Hydraulic Machin es", Tata McGraw Hill Publishing Co. Ltd.
2. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press
3. C.S.P. Ojha, R. Berndtsson, and P.N. Chandramouli, *"Fluid Mechanics and Machinery"*, Oxford University Publication – 2010
4. J.B. Evett, and C. Liu, *"Fluid Mechanics and Hydraulics* ", McGraw-Hill Book

TITLE OF THE COURSE: BASIC GEOTECHNICAL ENGINEERING

B.E., IV Semester, Civil Engineering

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	21CV44	CIE	50
Number of Lecture Hours/Week	03	SEE	50
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course Objectives:

This course will enable students to

1. To appreciate basic concepts of soil mechanics as an integral part in the knowledge of civil engineering. Also, to become familiar broadly with index properties of soil. Geotechnical engineering problems such as, foundation engineering, flow of water through soil medium and terminologies associated with geotechnical engineering.
2. To comprehend the classification of soil and fundamental constituents' minerals of soil.
3. To become familiar with engineering problems such as flow of water through soil medium and assess the improvement in mechanical behavior by densification of soil deposits using compaction.
4. To know the basic engineering properties and the mechanical behavior of different types of soil. This includes strength-deformation characteristics under shearing stresses. Also consolidation properties of clayey soils.

Modules	Teaching Hours	RBT Level
Module -1		
INTRODUCTION: History of soil mechanics, origin and formation of soil. Phase Diagram, definition of technical terms related to soil and their interrelationships. INDEX PROPERTIESOF SOIL: Laboratory methods to determine index properties of soil such as Consistency limits and indices, Water content (Oven Drying method & Rapid Moisture method), Specific gravity of soil solids (Pycnometer and density bottle	12 HRS	L1, L2,

method), in-situ density(core cutter and sand replacement method).		
Module -2		
SOIL CLASSIFICATION:BIS soil classification, plasticity chart, Particle size distribution (Sieve analysis and Hydrometer analysis only), gradation curve, Relative Density, Activity of Clay. **SOIL STRUCTURE AND CLAY MINERALOGY:** Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite and their application in Engineering.	10 HRS	L2,L4
Module -3		
FLOW OF WATER THROUGH SOILS: Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation, quick sand phenomena, Capillary Phenomena.**COMPACTION OF SOILS:** Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control - compactive effort & method of compaction, lift thickness and number of passes, Proctor's needle, Compacting equipments and their suitability.	10 HRS	L1, L2, L3
Module -4		
SHEAR STRENGTH OF SOIL: Concept Of Shear Strength, Mohr Coulomb Theory, Conventional And Modified Failure Envelops, Effective Stress Concept- Total Stress, Effective Stress And Neutral Stress, Concept Of Pore Pressure, Total And Effective Shear Strength Parameters, Factors Affecting Shear Strength Of Soils, Sensitivity And Thixotropy OfClay. Measurement Of Shearstrength Parameters - Direct Shear Test, Unconfined Compression Test, Triaxial Compression Test and Field Vane Shear Test, Test Under Different Drainage Conditions. Total And Effective Stress Paths.	10 HRS	L2, L3
Module -5		

CONSOLIDATION OF SOIL: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory - assumption and limitations. Derivation of Governing differential Equation Preconsolidation pressure and its determination by Casagrande's method. Over consolidation ratio, normally consolidated, under consolidated and over consolidated soils. Consolidation characteristics of soil (Cc, av, mv and Cv. Laboratory one dimensional consolidation test, characteristics of e-log(σ) curve, Determination of consolidation characteristics of soils compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method). Primary and secondary consolidation.	10 HRS	L1, L2, L3,

On the completion of this course students are expected to attain the following outcomes;

1. Will acquire an understanding of deferent types of soils, index properties and their importance in geotechnical engineering.
2. Will acquire the knowledge of classifyingthe soil based on its index properties and acquire the knowledge of fundamental constituent minerals of fine-grained soil.
3. 2. Will be able to determine permeability property of soils, compaction characteristics of soil and apply that knowledge to assess field compaction procedures
4. Will be able to estimate shear strength parameters of different types of soils using the data of different shear tests and comprehend Mohr-Coulomb failure theory.
5. 5. Ability to solve practical problems related to estimation of consolidation settlement of soil deposits also time required for the same.

Question Paper Pattern:

• The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
• The question paper will have ten full questions carrying equal marks.
• Each full question carries 20 marks.
• There will be two full questions (with a maximum of four sub questions) from each module.
• Each full question will have sub questions covering all the topics under a module.
• The students will have to answer five full questions, selecting one full question from each module.

CIE + Assignments: 15+35=50 Marks

There will be a 3 CIE's, the average of best of 2 CIE's will be considered and there will be a 35 marks for Assignments.

Text Books:

1. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics- (2000), New Age International (P) Ltd., New Delhi.

2. Punmia B C, Soil Mechanics and Foundation Engineering- (2012) , Laxmi Pulications.

3. Murthy V.N.S., Principles of Soil Mechanics and Foundation Engineering- (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.

4. Braja, M. Das, Geotechnical Engineering; (2002), Fifth Edition, Thomson 25 Business Information India (P) Ltd., India

Reference Books:

1. T.W. Lambe and R.V. Whitman, Soil Mechanics, John Wiley & Sons, 1969.

2. Donold P Coduto, Geotechnical Engineering- Phi Learning Private Limited, New Delhi

3. Shashi K. Gulathi & Manoj Datta, Geotechnical Engineering-. (2009), "Tata Mc Graw Hill.

4. Narasimha Rao A. V. & Venkatrahmaiah C, Numerical Problems, Examples and objective questions in Geotechnical Engineering-. (2000), Universities Press., Hyderabad.

5. Muni Budhu ,Soil Mechanics and Foundation Engg.- (2010), 3rd Edition, John Wiely & Sons

TITLE OF THE COURSE: CONCRETE TECHNOLOGY

B.E., IV Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]	
Subject Code: 21CV45	CIE: 50
Number of Lecture Hours/Week: 02	SEE: 50
Total Number of Lecture Hours: 30	Exam Hours: 03

CREDITS 02

Course Learning Objectives: This course will enable students to:

1. To recognize material characterization of ingredients of concrete and its influence on properties of concrete.
2. Proportion ingredients of Concrete to arrive at most desirable mechanical properties of Concrete. 3. Ascertain and measure engineering properties of concrete in fresh and hardened state which meet the requirement of real time structures.
4. To mix design concrete using IS 10262:2019.
5. To understand different types of modern concretes.

Modules	Teaching Hours	RBT Level
Module-1		
Concrete Ingredients Cement – Cement manufacturing process, chemical composition and their importance, hydration of cement, gel pore, capillary pore. Testing of cement. Fine aggregate: Functions, Physical properties, and application. M-sand introduction and manufacturing. Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, requirement. Recycled aggregates, Water – qualities of water.	5HRS	L1,L2,L3
Module-2		
Concrete Mix Proportioning Concept of Mix Design with and without admixtures, variables in proportioning and Exposure conditions, Selection criteria of ingredients used for mix design, listing of mix design methods, Procedure of mix proportioning. Numerical Examples of Mix Proportioning using IS-10262:2019. Batching and mixing Chemical admixtures plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures – Pozzolanic and cementitious materials, Fly ash, GGBS, silica fumes and rice husk ash.	6 HRS	L1,L2,L3, L4,L5
Module-3		
Fresh Concrete Workability-factors affecting workability. Measurement of workability–slump, Compaction factor and Vee-Bee Consistometer tests, flow tests. Segregation and		

bleeding. ConcreteTransporting, Placing and Compaction. Curing – Methods of curing – Water curing and accelerated curing.	5 HRS	L1,L2,L3
Module-4		
Hardened Concrete Factors influencing strength, W/C ratio, compaction, age, aggregate cement ratio, gel/space ratio, Maturity concept, testing of hardened concrete: compressive strength, split tensile strength and flexural strength. Non- destructive test: rebound hammer test, ultra-sonic pulse velocity test. Creep, shrinkage, and carbonation – factors affecting creep, shrinkage, and carbonation.	6 HRS	L1,L2,L3
Module-5		
Special Concretes Elasticity- factors affecting elasticity, types of elasticity. Relation between Modulus of Elasticity and Poisson's ratio. Durability- its importance, requirement of durability as per IS456. Permeability, corrosion- factors affecting corrosion. RMC- properties and requirement as per QCI-RMCPCS. Type of special concretes and their properties.	6 HRS	L1,L2,L3

Course outcomes: After studying this course, students will be able to:

1. Relate material characteristics and understand their influence on microstructure of concrete.
2. Distinguish concrete behavior with respect to its fresh and hardened properties.
3. Illustrate proportioning of different types of concrete mixes for required fresh and hardened properties using professional codes.
4. Adopt suitable concreting making methods and placing methods based on requirement.
5. Select a suitable type of concrete based on specific application.

Question Paper Pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

CIE + Assignments: 15+35=50 Marks

There will be a 3 CIE's, the average of best of 2 CIE's will be considered and there will be a 35 marks for Assignments.

Text Books:

1. M. L. Gambir, "Concrete Manual", Danpat Rai and sons, New Delhi
2. M.S Shetty, "Concrete Technology", S. Chand &Co. Ltd, New Delhi.

Reference Books:

1. Mehta P.K, "Properties of Concrete", Tata McGraw Hill Publications, New Delhi.
2. Neville AM, "Properties of Concrete", ELBS Publications, London.
3. Relevant BIS codes.

TITLE OF THE COURSE: **Computer Aided Building Planning and Drawing-LAB**

B.E., IV Semester, Civil Engineering

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	21CVL46	**CIE:**	50
Number of Lecture Hours/Week:	03	**SEE:**	50
Total Number of Lecture Hours:	20	**Exam Hours:**	03

CREDITS –01

Course objectives: Provide students with a basic understanding

- Achieve skill sets to prepare computer aided engineering drawings
- Understand the details of construction of different building elements.
- Visualize the completed form of the building and the intricacies of construction based on the engineering drawings.

Modules	**RBT Level/hrs**
Module -1 Drawing Basics: Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962 Simple engineering drawings with CAD drawing tools : Lines, Circle, Arc, Polyline, Multiline, Polygon, Rectangle, Spline, Ellipse, Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet, Using Text: Single line text, Multiline text, Spelling, Edit text, Special Features: View tools, Layers concept, Dimension tools, Hatching, Customising toolbars, Working with multiple drawings.	10 Hours L1,L2
Module -2 Drawings Related to Different Building Elements: Following drawings are to be prepared for the data given using CAD Software	10 Hours L2,L3,L4,L5,L6

a. Cross section of Masonry Wall Foundation, b. RCC columns with isolated & combined footings. c. Different types of staircases – Dog legged, Open well d. Lintel and chajja e. RCC slabs and beams f. Cross section of a pavement	
Module -3 Building Drawings: Principles of planning, Planning regulations and building bye-laws, factors affecting site selection, Functional planning of residential and public buildings, design aspects for different public buildings. Recommendations of NBC. Submission drawing (sanction drawing) with access to terrace including all details and statements as per the local bye-laws Drawing of Plan, elevation and sectional elevation including electrical, plumbing and sanitary services *using CAD software* for: a. Single story residential building b. Hostel building c. School building d. Draw the Single story residential building plan, elevation, sectional and site plan with all detailed naming as per municipal corporation rules	20 Hours L2,L3,L4,L5,L6
Course Outcomes: After studying this course, students will be able to 1. Gain a broad understanding of planning and designing of buildings 2. Prepare, read and interpret the drawings in a professional set up. 3. Know the procedures of submission of drawings and Develop working and submission drawings for building 4. Plan and design a residential or public building as per the given requirements	
Program Objectives • Engineering knowledge • Problem analysis • Interpretation of data	

Question paper pattern:

- There will be two full questions with sub divisions if necessary from Module 2 with each full question carrying *twenty* marks. Students have to answer one question.
- There will be two full questions from Module 3 with each full question carrying *thirty* marks. Students have to one answer one question.

Text book:

1. MG Shah, CM Kale, SY Patki, "Building drawing with an integrated approach to Built Environment

Drawing", Tata Mc Graw Hill Publishing co. Ltd., New Delhi

2. Gurucharan Singh, "Building Construction", Standard Publishers, & distributors, New Delhi.

3. Malik R S and Meo G S, "Civil Engineering Drawing", Asian Publishers/Computech Publications Pvt Ltd.

Reference Books:

1. Time Saver Standard by Dodge F. W., F. W. Dodge Corp.,

2. IS: 962-1989 (Code of practice for architectural and building drawing)

3. National Building Code, BIS, New Delhi.

TITLE OF THE COURSE: Surveying Practice –II Lab

B.E., IV Semester, Civil Engineering

[As per Choice Based Credit System (CBCS) scheme]

Course Code: 21CVL47	CIE Marks: 50
Number of Lecture Hours/Week :03	SEE Marks :50
Total Number of Hours:20	Exam Hours :03
Credits – 01	

Course Objectives: The objectives of this course is to make students to:

1. Apply the basic principles of engineering surveying and measurements
2. Follow effectively field procedures required for a professional surveyor
3. Use techniques, skills and conventional surveying instruments necessary for engineering practice.

Experiments:

1. To set-out simple curve by long chord method
2. To set-out simple curve by rankines method
3. Setting up , Levelling up , Centering and creation of file in Total station
4. Taking out basic measurements RDM ,REM & SHV using Total station
5. Determination of Area measurement using Total station
6. Establishment of new station using free stationing technique
7. Traversing using total station to prepare topographic map of Area
8. Contour surveying using Total station
9. Plotting of topographic details within contours

10. Downloading total station data and map complication
11. Strake out using Total station

Course outcomes: After a successful completion of the course, the student will be able to:

1. Apply the basic principles of engineering surveying for linear and angular measurements.
2. Comprehend effectively field procedures required for a professional surveyor.
3. Use techniques, skills and conventional surveying instruments necessary for engineering practice.
4. Working principle of total station
5. Use of Total station helps to fast working , Data collection , Software mapping ,Documentation
6. The data collected from the field in the software and producing terrain map of different configuration and views and calculating the quantity of earthwork .

Question paper pattern:

1. 11 are individual experiments.
2. Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
3. All exercises are to be included for practical examination.

Reference Books:

1. B.C. Punmia, "Surveying Vol.II", Laxmi Publications pvt. Ltd., New Delhi 2009.
2. Kanetkar T P and S V Kulkarni , Surveying and Levelling Part I, Pune VidyarthiGrihaPrakashan, 1988
3. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.-2009.
4. K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. – 2010 & Distributors.

TITLE OF THE COURSE: Fluid Mechanics and Hydraulic Machines Lab

B.E., IV Semester, Civil Engineering

[As per Choice Based Credit System (CBCS) scheme]

Course Code 21CVL48	**CIE Marks: 50**
Number of Lecture Hours/Week :03	**SEE Marks :50**
Total Number of Hours: 20	**Exam Hours: 03**

Credits – 01

Course Objectives: This course will enable students to;

1. Calibrate flow measuring devices.
2. Measure discharge and head losses in pipes.
3. Understand the fluid flow pattern.
4. Determine the force exerted by jet of water on vanes.

Experiments:

1. Verification of Bernoulli's equation. **L1,L2**
2. Determination of Cd for Venturimeter and Orifice meter. **L1,L2**
3. Determination of hydraulic coefficients of small vertical orifice. **L1,L2**
4. Calibration of Rectangular , Triangular and Trapezoidal Notch. **L1,L2**
5. Calibration of Ogee and Broad crested weir. **L1,L2**
6. Determination of Cd for Venturiflume. **L1,L2**
7. Calibration of collecting tank. **L1,L2**
8. Determination of Major and Minor Losses in Pipes. **L1,L2**
9. Determination of efficiency of Francis turbine. **L1,L2**
10. Determination of efficiency of Kaplan turbine. **L1,L2**
11. Determination of efficiency of centrifugal pump. **L1,L2**
12. Calibration of dead weight pressure gauge. **L1,L2**
13. Calibration of hydraulic Jump. **L1,L2**
14. Experimental determination of force exerted by a jet on flat, inclined and curved plates. **L1,L2**
15. Experimental determination of operating characteristics of pelton turbine. **L1,L2**
16. Demonstration Experiments: Reynold's experiment to understand laminar and turbulent flow , **L1,L2**

Course outcomes: During the course of study students will develop understanding of:

1. Properties of fluids and the use of various instruments for fluid flow measurement.
2. To calibrate various types of notches.
3. To calibrate various types of Weirs.

4.. Working of hydraulic machines under various conditions of working and their characteristics.

Question paper pattern:

· All experiments are to be included in the examination except demonstration exercises.

· Candidate to perform experiment assigned to him

· Marks are to be allotted as per the split up of marks shown on the cover page of answer script

Reference Books:

1. Sarbjit Singh , *Experiments in Fluid Mechanics* - PHI Pvt. Ltd.- New Delhi

2. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press

3. Hydraulics and Fluid Mechanics' – Dr. P.N. Modi & D r S.M. Seth, Standard Book House-
New Delhi. 2009 Edition.

Ability Enhancement Course : STAAD Pro

Subject Name : AEC STAAD Pro
Course Code : 21ACV411

Module 1: Introduction to STAAD Pro Software :
Introduction to Terminology of Software., configures , Commands, working procedures, Geometry, properties, Modelling,

Module 2: Analysis of 2D Beam:
Modeling and Analysis of 2D beams, simply supported beams, simply supported continuous beams, cantilever beams, subjected to different types of load cases like concentric load, Uniformly distributed load (UDL), uniformly varying load (UVL), moments.

Module 3: Analysis of 2D Portal Frame:
Modeling & Analysis of 2D Portal frame, with 1bay 1storey, 1bay 2storey, 2bay 1storey, 2bay 2storey, 2bay 3storey, 3bay 2storey, 3bay 3storey

Module 4: Analysis of Trusses:
Modeling & Analysis of of Trusses, Plain trusses

Module 5: : Analysis of 3D frame:
Modeling & Analysis of 2D Portal frame, with 1bay 1storey, 1bay 2storey, 2bay 1storey, 2bay 2storey, 2bay 3storey, 3bay 2storey, 3bay 3storey