



**K. K. Wagh Institute of Engineering Education and Research, Nashik**  
(Autonomous from Academic Year 2022-23)

**Details of Course Structure: S. Y. B. Tech (Civil Engineering)**

● **Summary of Credits and Total Marks for U. G. Programme:**

Semester	S.Y. B.Tech (Computer, IT, AI&DS, CSD – 6 divisions)		S.Y. B.Tech (E&TC, Mechanical, Civil, Chemical, Electrical and R& A – 10 divisions )	
	Total Credits (TH+PR/OR/TU)	Total Marks	Total Credits (TH+PR/OR/TU)	Total Marks
III	21	725	22	750
IV	21	725	20	700
<b>Total</b>	<b>42</b>	<b>1450</b>	<b>42</b>	<b>1450</b>

**Description of various Courses:**

Type of Course	Description	Type of Course	Description
ESC	Engineering Science Course - Workshop - Drawing- Fundamentals of different branches	DCC	Department Core Course
BSC	Basic Science Courses	DEC	Department Elective Course
LHSM	Liberal arts, Humanities, Social Sciences and Management courses	OEC	Open Elective Courses of other technical or emerging areas /Courses designed by Industry
PSI	Project work, Seminar, Internship, PBL	IMC	Induction and Mandatory Courses
NC/AC	Non Credit Courses/Audit Courses	ASM	Additional Specialized / MOOCs



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**Course Structure: Semester – III S. Y. B. Tech (Civil)**

Course Code	Course Type	Title of Course	Teaching Scheme Hrs./week			Evaluation Scheme and Marks								Credits			
			TH	TU	PR	In Sem	End Sem	CCE	TU	TW	PR	OR	Total	TH	TU	PR \$	Total
SMH222301	BSC	Applied Mathematics III	3	1	-	20	60	20	25	-	-	-	125	3	1	-	4
CIV222002	DCC	Mechanics of Structures	3	-	-	20	60	20	-	-	-	-	100	3	-	-	3
CIV222003	DCC	Fluid Mechanics	3	-	-	20	60	20	-	-	-	-	100	3	-	-	3
CIV222004	ESC	Architectural Planning and Design	3	-	-	20	60	20	-	-	-	-	100	3	-	-	3
CIV222005	DCC	Project Management	3	-	-	20	60	20	-	-	-	-	100	3	-	-	3
CIV222006	LHSM	Literature Study	1	-	-	-	-	-	-	25	-	-	25	1*	-	-	1
CIV222007	DCC	Mechanics of Structures Lab	-	-	2+2	-	-	-	-	25	-	50	75	-	-	2	2
CIV222008	DCC	Fluid Mechanics Lab	-	-	2	-	-	-	-	25	-	25	50	-	-	1	1
CIV222009	ESC	Architectural Planning and Design Lab	-	-	2	-	-	-	-	25	25	-	50	-	-	1	1
CIV222010	PSI	Computer Aided Drafting	-	-	2	-	-	-	-	25	-	-	25	-	-	1	1
<b>Total</b>			<b>16</b>	<b>1</b>	<b>10</b>	<b>100</b>	<b>300</b>	<b>100</b>	<b>25</b>	<b>125</b>	<b>25</b>	<b>75</b>	<b>750</b>	<b>15</b>	<b>1</b>	<b>6</b>	<b>22</b>

\* This Credit will be assessed as a TW.

\$ Credit for PR head are linked with TW & OR Marks.

**Chairman**

Board of Studies

Department of Civil Engineering  
K.K. Wagh Institute of Engineering  
Education & Research, Nashik



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**Course Structure: Semester – IV S. Y. B. Tech (Civil)**

Course Code	Course Type	Title of Course	Teaching Scheme Hrs./week			Assessment Scheme of Marks							Credits		
			TH	TU	PR	In Sem	End Sem	CCE	TW	PR	OR	Total	TH	PR \$	Total
CIV222011	DCC	Structural Analysis	3	-	-	20	60	20	-	-	-	100	3	-	3
CIV222012	DCC	Surveying	3	-	-	20	60	20	-	-	-	100	3	-	3
CIV222013	DCC	Concrete Technology	3	-	-	20	60	20	-	-	-	100	3	-	3
CIV222014	DCC	Remote Sensing & GIS	3	-	-	20	60	20	-	-	-	100	3	-	3
CIV222015	LHSM	Earth Sciences	3	-	-	20	60	20	-	-	-	100	3	-	3
CIV222016	ASM	Softwares in Civil Engineering	1	-	-	-	-	-	-	-	-	-	-	-	-
CIV222017	DCC	Surveying Lab	-	-	2+2	-	-	-	25	50	-	75	-	2	2
CIV222018	DCC	Concrete Technology Lab	-	-	2	-	-	-	25	-	25	50	-	1	1
CIV222019	DCC	Remote Sensing & GIS Lab	-	-	2	-	-	-	50	-	-	50	-	1	1
CIV222020	PSI	Project Based Learning	-	-	2	-	-	-	25	-	-	25	-	1	1
<b>Total</b>			<b>16</b>	<b>-</b>	<b>10</b>	<b>100</b>	<b>300</b>	<b>100</b>	<b>125</b>	<b>50</b>	<b>25</b>	<b>700</b>	<b>15</b>	<b>5</b>	<b>20</b>

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S. Y. B. Tech.			
Pattern 2022 Semester: III (Civil Engineering)			
SMH222301: Applied Mathematics-III			
Teaching Scheme:	Credit Scheme:	Examination Scheme:	
Theory :03hrs/week Tutorial:01hr/week	<b>03</b> <b>01</b>	Continuous Comprehensive Evaluation: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks Tutorial / Termwork: 25Marks	
<b>Prerequisite Courses:</b> - Higher Secondary Mathematics			
<b>Course Objectives:</b>			
1. Find General solution of higher-order linear differential equation with constant & Variable coefficient using different Methods.			
2. Understand the different techniques of statistical Analysis, Use of probability and probability distribution.			
3. Recognize nature of vector fields ,use different vector differential operators& able to evaluate Line integrals & Work-done.			
4. Solve Numerical problems using different Numerical methods, heat equation, wave equation by separation of variables.			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	Course Outcomes		Bloom's Level
<b>CO1</b>	Identify nature of vector field, understand basic concept of numerical methods, Probability Distribution, Measure of Central Tendency.		2-Understanding
<b>CO2</b>	Calculate Differentiation & Integration, Line Integral and solve L.D.E. using different Methods.		3- Apply
<b>CO3</b>	Apply Different techniques of statistical Analysis, Apply appropriate numerical methods to solve system of algebraic equations		3- Apply
<b>CO4</b>	Draw & Solve bending of beams, various P.D.E. & Evaluate line Integral & Work-done		3- Apply
<b>CO5</b>	Apply Concept of Statistics & Probability Distribution, Differential equations, Vector Calculus, Numerical Methods to various applications including real life problem.		4 -Analyze
COURSE CONTENTS			
<b>Unit I</b>	<b>Linear Differential Equations with Constant Coefficients</b>	<b>(08hrs+2hrsTutorial)</b>	<b>COs Mapped - CO1, CO2, CO3</b>
LDE of n <sup>th</sup> order with constant coefficients, Complementary Function, Particular Integral, General method, Shortcut methods, Method of variation of parameters, Cauchy's and Legendre's DE, Simultaneous and Symmetric simultaneous DE.			
<b>Unit II</b>	<b>Applications of Linear Differential Equations &amp; Partial Differential Equations</b>	<b>(08hrs+ 2hrsTutorial)</b>	<b>COs Mapped - CO1, CO2</b>



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Curvature, Modelling of Bending of beams, Wave equation, One and two dimensional Heat flow equations, Method of separation of variables. Applications of PDE to problems of Civil Engineering.			
<b>Unit III</b>	<b>Statistics &amp; Probability Distribution</b>	<b>(08hrs+ 2hrsTutorial)</b>	<b>COs Mapped - CO1, CO2, CO3</b>
<p><b>Statistics:</b> Measures of central tendency, Measures of dispersion, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression Curve fitting: fitting of straight line, parabola and related curves.</p> <p><b>Probability Distributions:</b> Binomial, Poisson &amp; Normal Distributions.</p>			
<b>Unit IV</b>	<b>Vector Calculus</b>	<b>(08hrs+ 2hrsTutorial)</b>	<b>COs Mapped -CO3, CO4,CO5</b>
<p><b>Vector Differentiation:</b> Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.</p> <p><b>Vector Integration:</b> Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem.</p>			
<b>Unit V</b>	<b>Numerical Methods</b>	<b>(08hrs+ 2hrsTutorial)</b>	<b>COs Mapped - CO4,CO5</b>
<p><b>Numerical Solutions of Algebraic and Transcendental equations:</b> Bisection, Secant, Regula-Falsi, Newton-Raphson and Successive Approximation Methods, Convergence and Stability</p> <p><b>Numerical Solutions of System of linear equations:</b> Gauss elimination, LU Decomposition, Cholesky, Jacobi and Gauss Seidel Methods</p>			
<b>TextBooks</b>			
<ol style="list-style-type: none"> <li>1. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill.</li> <li>2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi.</li> </ol>			
<b>Reference Books</b>			
<ol style="list-style-type: none"> <li>1. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).</li> <li>2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).</li> <li>3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Cengage Learning).</li> <li>4. Numerical Methods for Engineers, 7e by S. C. Chapra and R. P. Canale (McGraw-Hill Education)</li> <li>5. Introduction to Probability and Statistics for Engineers and Scientists, 5e, by Sheldon M. Ross (Elsevier Academic Press)</li> <li>6. Partial Differential Equations for Scientists and Engineers by S. J. Farlow (Dover Publications, 1993)</li> </ol>			



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Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>CO1</b>	3	3	-	-	-	-	-	-	-	-	-	3
<b>CO2</b>	3	3	-	-	2	-	-	-	-	-	-	3
<b>CO3</b>	3	2	-	2	2	-	-	-	-	-	-	3
<b>CO4</b>	3	2	2	3	2	-	-	-	-	-	-	3
<b>CO5</b>	3	-	-	-	2	-	-	-	-	-	-	3

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Alloted
1	Assignments ( Total 3 Assignment, Unit I and II 20 marks, Unit III and IV 20 marks and Unit V 10 marks & 50 marks will be converted to 10 Marks)	10
2	Tests on each unit using LearnCo ( Each test for 15 M and total will be converted out of 10 M)	10

List of Tutorial Assignments		
Sr. No.	Title	CO Mapped
1	Examples On LDE of nth order with constant coefficients	CO1, CO2, CO3
2	Examples on Method of variation of parameters, Cauchy's & Legendre's DE, Simultaneous DE.	CO1, CO2, CO3
3	Examples on Curvature, Modeling of Bending of beams, Wave equation, One and two dimensional Heat flow equations	CO1, CO2
4	Examples on Method of separation of variables. Applications of PDE to problems of Civil Engineering.	CO1, CO2
5	Solve problems on matrices using Matlab.	CO1, CO2, CO3, CO4
6	Solve system of equations using Matlab.	CO1, CO2, CO3, CO4
7	Examples on statistics.	CO1, CO2, CO3
8	Examples on probability distributions.	CO1, CO2, CO3
9	Examples on Vector differentiation.	CO3, CO4, CO5
10	Examples on Vector Integration.	CO3, CO4, CO5



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11	Examples on Numerical Solutions of Algebraic & Transcendental eq	CO4,CO5
12	Examples on Numerical Solutions of System of linear equations	CO4,CO5

<b>Guidelines for Tutorial / Termwork Assessment</b>		
<b>Sr. No.</b>	<b>Components for Tutorial / Termwork Assessment</b>	<b>Marks Allotted</b>
1	Assignment on computational software	5
2	Tutorial (Each tutorial carries 15 marks)	15
3	Attendance (Above 95 % : 05 Marks, below 75% : 0 Marks)	5



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S. Y. B. Tech. Pattern 2022 Semester: III (B. Tech Civil Engineering) CIV222002: Mechanics of Structures			
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>	
<b>Theory :03 hrs/week</b> <b>Practical (CIV222007): 04 hrs/week</b>	<b>03</b> <b>02</b>	<b>Continuous Comprehensive Evaluation: 20Marks</b> <b>In Sem Exam: 20Marks</b> <b>End Sem Exam: 60Marks</b> <b>Term work(CIV222007): 25 Marks</b> <b>Oral (CIV222007): 50Marks</b>	
<b>Prerequisite Courses, if any:</b> - Fundamentals of Physics, Mathematics, Engineering Mechanics.			
<b>Course Objectives:</b> 1. To apply the basic concepts of engineering mechanics in study of stress-strain behavior of different materials. 2. To understand the behavior of statically determinate structures and its further application in structural analysis.			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	<b>Course Outcomes</b>	<b>Bloom's Level</b>	
<b>CO1</b>	Discuss the concept of stress-strain for elastic, plastic & brittle material and describe different type of stresses in determinate, indeterminate, homogeneous and composite structures.	2-Understand	
<b>CO2</b>	Sketch Loading Diagram, Shear Force Diagram (SFD) and Bending Moment Diagram (BMD).	3-Apply	
<b>CO3</b>	Interpret bending and shear stresses and its applications for different cross sections.	3-Apply	
<b>CO4</b>	Apply theory of torsion to determine the stresses in circular shaft and illustrate principal planes and principal stresses and its diagrammatic representation.	3-Apply	
<b>CO5</b>	Analyse axially loaded and eccentrically loaded columns.	4- Analyse.	
<b>COURSE CONTENTS</b>			
<b>Unit I</b>	<b>Simple Stresses and Strains</b>	<b>(08hrs)</b>	<b>COs Mapped - CO1</b>
a) Materials used in construction ,concepts of stress and strains, Hook's Law, stress-strain diagram for elastic, plastic materials and brittle materials, idealized stress-strain diagram, concept of axial stresses (compression, tension), strains (linear, lateral, shear and volumetric), Elastic constants and their relations. Stresses and strains due to change in temperature and its applications in RC & Steel frames. b) Stresses, strains and deformations in bars of varying sections, composite sections.			
<b>Unit II</b>	<b>Shear Force and Bending Moment Diagram</b>	<b>(08hrs)</b>	<b>COs Mapped - CO2</b>
Concept of shear force and bending moment. Relation between shear force, bending moment and intensity of loading. Shear force and bending moment diagrams for determinate beams subjected to concentrated, uniformly distributed, uniformly varying loads and couples.			



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<b>Unit III</b>	<b>Shear and Bending Stresses</b>	<b>(08hrs)</b>	<b>COs Mapped – CO3</b>
<p>a) Bending stresses in beams: theory of simple or pure bending, flexure formula, bending stress distribution diagrams, moment of resistance, section modulus, effect of moment of inertia &amp; section modulus on moment of resistance of section.</p> <p>b) Shear stresses in beams: concept of shear, complimentary shear, derivation of shear stress formula, shear stress distribution. Maximum and average shear stress for circular and rectangular sections.</p>			
<b>Unit IV</b>	<b>Theory of Torsion and Principal Stresses and Strains</b>	<b>(08hrs)</b>	<b>COs Mapped – CO4</b>
<p>a) Torsion Theory, concept, assumptions, stresses and strains due to torsion, concept of torsion in building frame.</p> <p>b) Principal stresses and strains: principal planes and principal stresses, normal and shear stresses on an oblique plane, magnitude and orientation of principal stresses and maximum shear stress.</p>			
<b>Unit V</b>	<b>Axially and Eccentrically Loaded Columns.</b>	<b>(08hrs)</b>	<b>COs Mapped – CO5</b>
<p>a) Axially loaded columns: concept of critical load and buckling, Euler's formula for buckling load, Rankine's formula, safe load on column and limitations of Euler's formula.</p> <p>b) Direct and bending stresses for eccentrically loaded short columns. Concept of core of section for solid and hollow rectangular and circular sections.</p>			
<b>Text Books</b>			
<ol style="list-style-type: none"> <li>Strength of Materials by S. S. Ratan, Tata McGraw Hill.</li> <li>Strength of Materials by S Ramamrutham, Dhanpatrai Publishing Company, New Delhi</li> <li>Mechanics of Structures Vol. I &amp;II by S. B. Junnarkar and Dr. H. J. Shah, Twenty second edition, Charotar Publishing House Pvt Ltd.</li> <li>Strength of Materials by R. Subramanian, Oxford University Press.</li> </ol>			
<b>Reference Books</b>			
<ol style="list-style-type: none"> <li>Mechanics of Materials by Beer and Johnston, McGraw Hill Publication.</li> <li>Intermediate Structural Analysis by R. C. Hibbler, Pearson Education Publishers.</li> <li>Mechanics of Materials by Gere &amp; Timoshenko, CBC publisher.</li> <li>Introduction to Mechanics of Solids by E.P. Popov, Prantice Hall Publication.</li> </ol>			

Strength of CO-PO Mapping														
	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	PS O1	PS O2
<b>CO1</b>	3	2	3	3	3	-	-	-	-	-	-	3	3	-
<b>CO2</b>	3	3	3	3	3	-	-	-	-	2	-	3	3	-
<b>CO3</b>	3	2	3	3	3	-	-	-	-	2	-	3	3	-
<b>CO4</b>	3	3	3	2	3	-	-	-	-	-	-	3	3	-
<b>CO5</b>	3	3	3	3	3	-	-	-	-	-	-	3	3	-
<b>Average</b>	3	2.6	3	2.8	3	-	-	-	-	2	-	3	3	-



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<b>Guidelines for Continuous Comprehensive Evaluation of Theory Course</b>		
<b>Sr. No.</b>	<b>Components for Continuous Comprehensive Evaluation</b>	<b>Marks Allotted</b>
1	Assignments on Unit-1, Unit-2, Unit-3 & Unit-4	15
2	LMS Tests	05
	<b>Total</b>	<b>20</b>



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S. Y. B. Tech.		
Pattern 2022 Semester: III (B. Tech Civil Engineering )		
CIV222003 : Fluid Mechanics		
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>
<b>Theory :03 hrs/week</b> <b>Practical (CIV222008) : 02 hrs/week</b>	<b>03</b> <b>01</b>	<b>Continuous Comprehensive Evaluation: 20 Marks</b> <b>In Sem Exam: 20 Marks</b> <b>End Sem Exam: 60 Marks</b> <b>Term work (CIV222008): 25 Marks</b> <b>Oral (CIV222008): 25 Marks</b>
<b>Prerequisite Courses, if any:</b> - Fundamentals of Engineering Mechanics, Engineering Mathematics and Engineering Physics.		
<b>Course Objectives:</b>		
<ol style="list-style-type: none"> <li>To gain a thorough understanding of the fundamentals of Fluid Mechanics, the characteristics of Fluids and the concept of submerged and buoyant objects in a static fluid.</li> <li>To utilize the principles of continuity, momentum and energy in the context of fluid motion.</li> <li>To apply the fundamental principles of Fluid Mechanics to solve real-world civil engineering problems</li> </ol>		
<b>Course Outcomes:</b> On completion of the course, students will be able to–		
	<b>Course Outcomes</b>	<b>Bloom's Level</b>
<b>CO1</b>	To recall the basic fluid properties and state concepts of buoyancy.	1.Remember
<b>CO2</b>	Identify the various pressure measuring devices and explain the various numbers in dimensional analysis.	2.Understand
<b>CO3</b>	Discuss the Bernoulli's equation and uses of venturimeter.	2.Understand
<b>CO4</b>	Describe Laminar and turbulent flow and recognize its characteristics.	2.Understand
<b>CO5</b>	Solve the practical problems involving boundary layer theory and flow through pipes.	3.Apply
<b>COURSE CONTENTS</b>		
<b>Unit I</b>	<b>Introduction to fluid mechanics and Flotation</b>	<b>(08hrs)</b>
		<b>COs Mapped - CO1</b>
<p>Definition of fluid and fluid mechanics: Examples and practical applications involving fluids at rest and in motion. Physical properties of fluids: density, specific weight, specific volume, relative density, and viscosity. Newton's law of viscosity, classification of fluids, rheological diagram, dynamic and kinematic viscosity, compressibility, cohesion, adhesion, surface tension, capillarity, vapor pressure. Problems involving the use of the above fluid properties.</p> <p>Principle of flotation and buoyancy, equilibrium of floating and submerged bodies, stability of floating and submerged bodies. Metacenter and metacentric height and its determination (experimental and analytical methods).</p>		
<b>Unit II</b>	<b>Fluid Statics and Dimensional Analysis</b>	<b>(08hrs)</b>
		<b>COs Mapped - CO2</b>
<p>The basic equation of hydrostatics, the concept of pressure head, measurement of pressure (absolute, gauge), application of the basic equation of hydrostatics, pressure measuring devices (simple manometers, differential manometers: U-tube, inclined, mechanical gauges and precision manometers, pressure transducers and their types), center of pressure, total pressure on plane and curved surfaces,</p>		



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practical applications.			
Dimensions of physical quantities, dimensional homogeneity, dimensional analysis using Buckingham's $\pi$ theorem method, geometric, kinematic, and dynamic similarity, important dimensionless parameters (Reynolds number, Froude number, Euler number, Mach number, and Weber number) and their significance, model laws (Froude's Law and Reynolds' Law).			
<b>Unit III</b>	<b>Fluid Dynamics And Bernoulli's Equation</b>	<b>(08hrs)</b>	<b>COs Mapped - CO3</b>
Forces acting on a fluid mass in motion, Euler's equation of motion along a streamline, and its integration; assumptions of Bernoulli's equation; Modified Bernoulli's equation, its applications, and limitations; hydraulic grade line and total energy line. Linear momentum equation and kinetic energy correction factor; momentum correction factor (only information). Venturi meter, orifice, and orifice meter, hydraulic coefficients for orifice, Pitot tube.			
<b>Unit IV</b>	<b>Laminar Flow and Turbulent Flow</b>	<b>(08hrs)</b>	<b>COs Mapped – CO4</b>
Reynolds experiment, laminar flow through a circular pipe, flow between two fixed parallel plates, methods of measurement of viscosity (Newton's Law of Viscosity: Rotating cylinder viscometer, Stokes' law: Falling sphere viscometer, Hagen Poiseuille Equation: Redwood Viscometer, Darcy's law, Transition from laminar to turbulent flow). Introduction of turbulent flow, Characteristics of flow, instantaneous velocity, temporal mean velocity, scale of turbulence and intensity of turbulence.			
<b>Unit V</b>	<b>Boundary Layer Theory and Flow Through Pipes</b>	<b>(08hrs)</b>	<b>COs Mapped - CO5</b>
Concept of boundary layer, development of boundary layer on a flat plate; nominal, displacement, momentum, energy thicknesses; laminar, transitional, and turbulent boundary layer; laminar sub-layer; local and mean drag coefficients; hydro dynamically smooth and rough boundaries; boundary layer separation and its control. Flow through pipes: energy losses in pipe flow (major losses and minor losses); Darcy-Weisbach Equation; variation of friction factor for laminar flow and turbulent flow; resistance to flow in smooth and rough pipes; friction factor for commercial pipes flowing through siphons.			
<b>Text Books</b>			
<ol style="list-style-type: none"> <li>1. Hydraulics and Fluid Mechanics including Hydraulic Machine by Dr P. N. Modi &amp; S. M. Seth Pub: Standard book house, Delhi-6</li> <li>2. Flow in Open Channels by K Subramanya, Pub: Tata McGraw Hill, New Delhi</li> <li>3. A Text Book on Fluid Mechanics and Hydraulic Machines by Sukumar Pati Pub: McGraw Hill, New Delhi</li> </ol>			
<b>Reference Books</b>			
<ol style="list-style-type: none"> <li>1. Engineering Fluid Mechanics by R. J. Garde and A.J Mirajgaonkar, Pub: SCITECH Publications( India )Pvt.Ltd, Chennai</li> <li>2. Fluid Mechanics and its Applications, Vijay Gupta, Santosh K Gupta, New Age international pvt. Ltd, New Delhi,</li> <li>3. Fluid Mechanics, Fundamentals and applications by Yunus. A Cengel and John.M Cimbala, Mc Graw Hill International, New Delhi.</li> <li>4. Fluid Mechanics by Streeter, Wylie and Bedford – Pub: McGraw Hill International, New Delhi.</li> <li>5. Open Channel Hydraulics by Ven Tee Chow, Pub: Mcgraw- Hill Book Company- Koga.</li> <li>6. A Text Book of Fluid Mechanics and Hydraulic Machines- by Dr. R K Rajput Pub: S Chand and Co Ltd. New Delhi</li> </ol>			



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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1	--	--	--	--	--	--	1	--	--
CO2	3	3	3	1	1	1	--	--	--	--	--	1	1	2
CO3	3	3	3	1	1	--	--	--	--	--	--	1	--	--
CO4	3	3	3	2	2	--	--	--	--	--	--	1	2	--
CO5	--	--	2	3	3	--	--	--	3	--	--	3	3	3
Average	3.0	3.0	2.80	2.0	1.6	1.5	1.0	--	2.50	3.0	2.00	1.67	2.0	2.0

<b>Guidelines for Continuous Comprehensive Evaluation of Theory Course</b>		
<b>Sr. No.</b>	<b>Components for Continuous Comprehensive Evaluation</b>	<b>Marks Allotted</b>
1	Three Assignments on unit-1, Unit-2, Unit-3 & 4	15
2	LMS Tests	05
	<b>Total</b>	<b>20</b>



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S. Y. B. Tech.			
Pattern 2022 Semester: III (B. Tech Civil Engineering)			
CIV222004: Architectural Planning and Design			
Teaching Scheme:	Credit Scheme:	Examination Scheme:	
Theory :03 hrs/week Practical (CIV222009): 02 hrs/week	03 01	Continuous Comprehensive Evaluation: 20 Marks In Sem Exam: 20 Marks End Sem Exam: 60 Marks Term work (CIV222009) : 25 Marks Practical (CIV222009): 25 Marks	
<b>Prerequisite Courses, if any:</b> - Fundamentals of Engineering Graphics, Basic information of Materials used in construction.			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	Course Outcomes	Bloom's Level	
CO1	Identify types of building and basic requirements of building components.	2-Understand	
CO2	Understand different Legal aspects	2-Understand	
CO3	Make use of Architectural Principles and Building byelaws for building construction.	3-Apply	
CO4	Plan effectively various types of Residential and Public Building according to their utility, functions with reference to National Building Code.	3-Apply	
CO5	Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.	3-Apply	
COURSE CONTENTS			
Unit I	Introduction to Building Construction	(08hrs)	COs Mapped - CO1
Introduction to Building Construction– Definition, Types of Building as per National Building Code. Types and their requirements - Sub structure, super structure, door, window, arch, flooring and roofing Introduction and IS specifications of Construction material - bricks, concrete blocks, stone, cement, and aggregates, steel. Masonry– Introduction to types of masonry (Brick, stone), Types of bonds, construction procedure, and supervision. Formwork: Introduction and Type, Introduction to Slip formwork, Introduction to Underpinning, Types of scaffolding.			
Unit II	Building Byelaws and Introduction to Architectural Considerations	(08hrs)	COs Mapped – CO2, CO3
Building Byelaws: Necessity of bye-laws, plot sizes, road width, opens spaces, floor area ratio (F.A.R.), concept of Volume Plot Area Ration (V.P.R.), Marginal distances, building line, control line, height regulations, room sizes, Area calculations (built-up area, carpet area), Rules for ventilation, lighting, Vertical circulation, Sanitation and Parking of vehicles. Minimum Standard Dimensions according to Byelaws. Introduction to Architectural Considerations: Principles of Building Planning and Architectural planning, Concept of Line plan, Developed Plan, Elevation, Section, Selection of scales for various drawings, dimensioning, abbreviations and Symbols as per IS 962-1989. Elements of perspective drawings - Parallel and Angular type.			
Unit III	Architectural Planning and Drawing	(08hrs)	COs Mapped – CO3, CO4, CO5
Residential Buildings - Functional requirements and dimensions. Developed Plan, Elevation and Sectional Elevation of different types Residential Building. Design of staircase: Dog legged /Quarter turn. Public			



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Building- Functional requirements and dimensions. Green Building- Salient features, planning concepts and rating systems of Green Building.

<b>Unit IV</b>	<b>Plumbing, Protective Coatings and Recent Trends in Architectural Planning</b>	<b>(08hrs)</b>	<b>COs Mapped – CO1, CO4</b>
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Plumbing: Introduction; Components; Materials used and Systems of plumbing Protective Coatings: Plastering; Painting; Pointing Recent trends in Architectural Construction: Light weight construction, Mivan Constructions, Mobile home, Compact home. Introduction to automation in construction.

<b>Unit V</b>	<b>Town Planning and Legal Aspects</b>	<b>(08hrs)</b>	<b>COs Mapped – CO2</b>
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Necessity of town planning. Development plan and its importance, Land use zoning, N.A. Sanction procedure, Aspects of zoning. 7/12 abstract, Form 6 and its types. Concept of Transferable Development Rights (TDR), List of documents from commencement to completion to be submitted to local authority. Real Estate Regulatory Authority (RERA), Maharashtra Regional and Town Planning (MRTP) Act, Online facilities provided by Town Planning Department.

**Text Books**

1. Building Construction by B.C. Punmia, Laxmi Publications.
2. Building Materials by S.V.Deodhar, Khanna Publication.
3. Building Construction by S.C. Rangwala, Charotdar Publications.
4. Building Construction by Bindra and Arora, Dhanpat Rai Publications.
5. Building Drawings with an integrated Approach to Built-Environment by M. G. Shah, C. M. Kale and S. Y. Patki, New Delhi, Tata McGraw Hill. (5th edition.)

**Reference Books**

1. Building Materials by S. K. Duggal, New Age International Publishers.
2. Building Materials Technology by Ruth T. Brantley & L. Reed Brantley, Tata McGraw Hill.
3. National Building Code (NBC-2005)
4. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings.
5. Development plan and DCP Rules of urban local body, New Delhi, Volume 12.
6. Maharashtra Regional and Town Planning (MRTP) Act-1966
7. Architectural Detailing: Function, Constructability, Aesthetics by Edward Allen and Patrick Rand.

	Strength of CO-PO/PSO Mapping													
	PO											PSO		
<b>CO 1</b>	1	1	2	1	-	2	1	1	-	-	-	1	-	-
<b>CO 2</b>	2	1	2	-	-	2	-	2	1	1	1	1	2	-
<b>CO 3</b>	-	-	-	1	3	1	3	1	2	2	1	2	2	-
<b>CO 4</b>	-	-	-	1	1	2	2	2	2	2	2	2	2	1
<b>CO 5</b>	-	-	-	-	1	2	1	2	1	1	1	-	-	-
<b>Average</b>	2	1	2	1	1	2	2	2	2	2	1	2	2	1



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<b>Guidelines for Continuous Comprehensive Evaluation of Theory Course</b>		
<b>Sr. No.</b>	<b>Components for Continuous Comprehensive Evaluation</b>	<b>Marks Allotted</b>
1	Five Assignments on unit-1, Unit-2, Unit-3 unit 4& unit 5	15
2	LMS Tests	05
	<b>Total</b>	<b>20</b>



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S. Y. B. Tech. Pattern 2022 Semester: III (B. Tech Civil Engineering) CIV222005: Project Management			
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>	
<b>Theory :03 hrs/week</b>	<b>03</b>	<b>Continuous Comprehensive Evaluation: 20 Marks</b> <b>In Sem Exam: 20 Marks</b> <b>End Sem Exam: 60 Marks</b>	
<b>Prerequisite Courses, if any:</b> - Fundamentals of Management, Indian Construction Industry, Economics.			
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>Describe the various concepts involved in Project Management</li> <li>Explain scientific methods of planning and management</li> <li>Differentiate the methods of project selection and recommend the best economical project.</li> </ol>			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	<b>Course Outcomes</b>	<b>Bloom's Level</b>	
<b>CO1</b>	List the attributes of a successful project manager.	2-Understand	
<b>CO2</b>	Carry out financial appraisal of a project through various methods,	3-Apply	
<b>CO3</b>	Apply project management knowledge for drawing work break down structure and Estimate the break-even point.	3-Apply	
<b>CO4</b>	Draw the CPM Network for Construction project	4-Analyze	
<b>CO5</b>	Carry out resource loading and resource levelling.	4-Analyze	
<b>COURSE CONTENTS</b>			
<b>Unit I</b>	<b>Defining Project and Project Management</b>	<b>(08 hrs)</b>	<b>COs Mapped - CO1</b>
Definition of a project, project vs operations, necessity of project management, project life cycle, Role of project manager, negotiations and resolving conflicts. Various organization structures. PM knowledge areas as per project management body of knowledge (PMBOK), project management institute (PMI).			
<b>Unit II</b>	<b>Project Formulation and Appraisal</b>	<b>(08 hrs)</b>	<b>COs Mapped - CO2</b>
Project formulation: process and constraints; Project feasibility: types and components; Project appraisal: financial and economic; ascertaining project costs and benefits; Financial appraisal techniques – payback period, benefit cost ratio, net present value, internal rate of return; Social cost benefit analysis (an overview).			
<b>Unit III</b>	<b>Project Planning</b>	<b>(08 hrs)</b>	<b>COs Mapped – CO3</b>
Project planning process; Planning for project work (work breakdown structure); Planning for manpower and organization; Planning for information system; Breakeven analysis; Cost performance / Schedule performance / Project performance index; Cost overrun; Project budgeting.			



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<b>Unit IV</b>	<b>Project Scheduling and Monitoring</b>	<b>(08 hrs)</b>	<b>COs Mapped – CO4</b>
Project scheduling: definition and steps; Network techniques in project scheduling; Gantt Chart (Concept only); Activity on arc/node; Forward and backward pass; Critical path and slack; PERT, Project monitoring: definition and criteria			
<b>Unit V</b>	<b>Project Resource Management</b>	<b>(08 hrs)</b>	<b>COs Mapped – CO5</b>
Resource management: resource loading and resource leveling; Project reporting; Project cash flows: elements, principles, estimation.			
<b>Text Books</b>			
1. Project planning and Control with PERT and CPM by DR. B.C. Punmia and K.K.Khandelwal Publisher: Firewall Media, Laxmi publication New Delhi. 2. Project management Principles and Techniques by B.B. Goel Publisher: Deep and Deep publisher			
<b>Reference Books</b>			
1. Construction Project Management-Planning, Scheduling and Controlling by K. K. Chitkara, Tata McGraw Hill Publishing Company, New Delhi 2. Construction Management and Planning by B. Sengupta and H. Guha, Tata McGraw Hill Publishing Company, New Delhi. 3. Projects by Prassana Chandra. McGraw Hill Publications 4. Project Management by K. Nagrajan. New Age International Publishers			

<b>Strength of CO-PO Mapping</b>														
	<b>PO</b>												<b>PSO</b>	
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>
<b>CO1</b>	3	1	-	-	1	3	1	2	2	2	3	3	2	2
<b>CO2</b>	1	-	2	2	1	1	-	-	-	-	-	2	2	2
<b>CO3</b>	3	3	3	3	2	-	-	-	-	-	-	3	2	2
<b>CO4</b>	3	3	3	3	2	-	-	1	2	1	2	2	2	2
<b>CO5</b>	2	2	2	-	-	-	-	-	-	-	-	2	2	2
<b>Average</b>	2	2	2	2	1	2	1	1	2	1	2	3	2	2

<b>Guidelines for Continuous Comprehensive Evaluation of Theory Course</b>		
<b>Sr. No.</b>	<b>Components for Continuous Comprehensive Evaluation</b>	<b>Marks Allotted</b>
1	Assignment No.1 Unit-1, 2; Assignment No.2-Unit-3,4	15
2	LMS Tests	05
	<b>Total</b>	<b>20</b>



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<b>S. Y. B. Tech.</b>			
<b>Pattern 2022 Semester: III (B. Tech Civil Engineering)</b>			
<b>CIV222006: Literature Study</b>			
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>	
<b>Theory :01 hr/week</b>	<b>01</b>	<b>Term work: 25 Marks</b>	
<b>Course Objectives:</b>			
1. To Understand the basics of research and the research process			
2. Understand the steps followed in research			
3. Understand the importance of Literature Survey			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	<b>Course Outcomes</b>	<b>Bloom's Level</b>	
<b>CO1</b>	Understand formulating a research problem	2. Understand	
<b>CO2</b>	Understand the significance of literature survey	2. Understand	
<b>COURSE CONTENTS</b>			
<b>Unit I</b>	<b>Research problem</b>	<b>(05hrs)</b>	<b>COs Mapped - CO1</b>
Defining and formulating the research problem, Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, necessity of defining the problem			
<b>Unit II</b>	<b>Literature review</b>	<b>(06hrs)</b>	<b>COs Mapped – CO2</b>
importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.			
<b>Text Books</b>			
1. C. R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques, New Age International publishers,.			
2. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 2nd Edition, SAGE, 2005			
<b>Reference Books</b>			
1. Creswell, John W. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications, 2013.			
2. Singh, Y. K. (2006). Fundamental of Research Methodology and Statistics. New Delhi. New International (P) Limited, Publishers.			
3. Best and Kahn, Research Methodology, PHI Limited			
4. Miles, Huberman, A. M., Saldana J. Qualitative data analysis: A methods sourcebook – Third edition, Sage Publication.			



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Strength of CO-PO Mapping														
	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
<b>CO1</b>	3	1	3	1	1	-	2	1	1	-	-	1	-	-
<b>CO2</b>	3	1	3	1	1	-	2	1	1	-	-	1	-	-
<b>Average</b>	3	1	3	1	1	-	2	1	1	-	-	1	-	-

List of Laboratory Experiments / Assignments		
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Assignment 1	CO1
2	Assignment 2	CO2
Guidelines for Termwork Assessment		
1. Each experiment from lab journal is assessed for thirty marks based on three rubrics. 2. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.		



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<b>S. Y. B. Tech.</b>		
<b>Pattern 2022 Semester: III (B. Tech Civil Engineering)</b>		
<b>CIV222007: Mechanics of Structures Lab</b>		
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>
<b>Practical : 04 hrs/week</b>	<b>02</b>	<b>Term work : 25 Marks</b> <b>Oral: 50Marks</b>
<b>Prerequisite Courses, if any:</b> - Fundamentals of Physics, Mathematics, Engineering Mechanics.		
<b>Course Objectives:</b> 1. To apply the basic concepts of engineering mechanics in study of stress strain behavior of different materials 2. To understand the behaviors of statically determinate structures and its further application in structural analysis		
<b>Course Outcomes:</b> On completion of the course, students will be able to–		
	<b>Course Outcomes</b>	<b>Bloom's Level</b>
<b>CO1</b>	Estimate the compressive, tensile, flexural strength of various materials used in constructions like steel, timber, plywood, bricks and tiles.	2-Understand
<b>CO2</b>	Apply the acquired knowledge to ensure quality of materials as per specifications prescribed in Indian standard codes.	3-Apply
<b>CO3</b>	Analyse the structural behaviour of materials under various loading configurations.	4- Analyse.
<b>CO4</b>	Evaluate the test results with the relevance of their field applications.	5- Evaluate

<b>List of Laboratory Experiments / Assignments</b>		
<b>Sr. No.</b>	<b>Laboratory Experiments / Assignments</b>	<b>CO Mapped</b>
1	Tension Test on Mild Steel	<b>CO1</b>
2	Tension Test on TMT Steel	<b>CO1</b>
3	Shear Test on Mild Steel	<b>CO1</b>
4	Impact Test on Mild Steel, Aluminium & Brass	<b>CO1</b>
5	Compression Test on Timber	<b>CO1</b>
6	Bending Test on Timber	<b>CO3</b>
7	Bending Test on Plywood	<b>CO3</b>
8	Compressive Strength Test of Bricks	<b>CO1</b>
9	Water Absorption Test on Bricks	<b>CO1</b>
10	Efflorescence Test on Bricks	<b>CO1</b>
11	Flexural Strength of Flooring Tiles	<b>CO3</b>



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12	Abrasion Test of Flooring Tiles	<b>CO1</b>
13	Material survey – steel, timber, plywood, bricks and tiles	<b>CO1</b>
<b>Guidelines for Laboratory Conduction</b>		
<ol style="list-style-type: none"><li>1. Teacher will brief the given experiment to students about the procedure, observations, calculations and outcome of the experiment.</li><li>2. Apparatus and equipment's required for the allotted experiment will be provided by the lab assistants.</li><li>3. Students will perform the allotted experiment under the supervision of faculty and lab assistant.</li><li>4. After performing the experiment students will check their readings, calculations from the faculty.</li></ol>		
<b>Guidelines for Student's Lab Journal</b>		
Write-up should include title, aim, diagram, procedure, observations, graphs, calculations, conclusion and questions, if any.		
<b>Guidelines for Termwork Assessment</b>		
<ol style="list-style-type: none"><li>1. Each experiment from lab journal is assessed for 30 marks based on three rubrics.</li><li>2. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries 10 marks.</li></ol>		



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<b>S. Y. B. Tech.</b>		
<b>Pattern 2022 Semester: III (B. Tech Civil Engineering )</b>		
<b>CIV222008 : Fluid Mechanics Lab</b>		
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>
<b>Practical : 02 hrs/week</b>	<b>01</b>	<b>Term work: 25 Marks</b> <b>Oral: 25 Marks</b>
<b>Prerequisite Courses, if any: -</b>		
<b>Course Objectives:</b>		
1. To understand conceptually the properties of fluid, fluid statics, fluid kinematics and fluid dynamics, dimensional analysis, boundary layer theory, open channel flow and fluid flow around submerged objects.		
2. To apply principles of continuity, mass, momentum and energy as applied to fluid at rest as well as for fluid flow in open channel.		
3. To apply fundamental principles of fluid mechanics for the solution of practical Civil Engineering problems.		
<b>Course Outcomes:</b> On completion of the course, students will be able to–		
	<b>Course Outcomes</b>	<b>Bloom's Level</b>
<b>CO1</b>	To recall the basic fluid properties and state concepts of buoyancy.	1.Remember
<b>CO2</b>	Identify the various pressure measuring devices and explain the various numbers in dimensional analysis.	2.Understand
<b>CO3</b>	Discuss the Bernoulli's equation and uses of venturimeter.	2.Understand
<b>CO4</b>	Describe Laminar and turbulent flow and recognize its characteristics.	2.Understand
<b>CO5</b>	Solve the practical problems involving boundary layer theory and flow through pipes.	3.Apply

<b>List of Laboratory Experiments / Assignments</b>		
<b>Sr. No.</b>	<b>Laboratory Experiments / Assignments</b>	<b>CO Mapped</b>
1	Measurement of viscosity of fluid by Redwood viscometer.	<b>CO1</b>
2	Measurement of pressures using different pressure measuring devices	<b>CO2,CO3</b>
3	Determination of stability of floating bodies using ship models.	<b>CO1</b>
4	Calibration of Venturimeter / Orifice meter.	<b>CO2</b>
5	Transition of Laminar and turbulent flow through pipes.	<b>CO4</b>
6	Experimental verification of Bernoulli's theorem with reference to loss of energy	<b>CO3</b>
7	Determination of major/minor losses in a friction factor /pipe system for a given pipe.	<b>CO5</b>
8	Demonstration of fluid flow through appropriate VCD/Audio visual / PPT's/ Software.	<b>CO5</b>



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**Guidelines for Laboratory Conduction**

1. Teacher will brief the given experiment to students its procedure, observations calculation, and outcome of this experiment.
2. Apparatus and equipment's required for the allotted experiment will be provided by the lab assistants using SOP.
3. Students will perform the allotted experiment in a group (two students in each group) under the supervision of faculty and lab assistant.
4. After performing the experiment students will check their readings, calculations from the teacher.
5. After checking they have to write the conclusion of the final result.

**Guidelines for Student's Lab Journal**

Write-up should include title, aim, and diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.

**Guidelines for Term work Assessment**

1. Each experiment from lab journal is assessed for thirty marks based on three rubrics.
2. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.



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<b>S. Y. B. Tech.</b> <b>Pattern 2022 Semester: III (B. Tech Civil Engineering)</b> <b>CIV222009: Architectural Planning and Design Lab</b>		
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>
<b>Practical : 02 hrs/week</b>	<b>01</b>	<b>Term work : 25 Marks</b> <b>Practical : 25 Marks</b>
<b>Prerequisite Courses, if any:</b> - Fundamentals of Engineering Graphics, Basic information of Materials used in construction.		
<b>Course Outcomes:</b> On completion of the course, students will be able to–		
	<b>Course Outcomes</b>	<b>Bloom's Level</b>
<b>CO1</b>	Understand different stages of construction.	2-Understand
<b>CO2</b>	Plan effectively various types of Residential according to their utility, functions with reference to building bye laws.	3-Apply
<b>CO3</b>	Plan effectively various types of Public Building according to their utility, functions with reference to building bye laws.	3-Apply

<b>List of Laboratory Experiments / Assignments</b>		
<b>Sr. No.</b>	<b>Laboratory Experiments / Assignments</b>	<b>CO Mapped</b>
1	To prepare submission drawing for residential building.	<b>CO1, CO2, CO3</b>
2	To prepare foundation plan for residential building.	<b>CO1</b>
3	To prepare the layout for water supply and drainage line (For residential building planned in assignment 1)	<b>CO1</b>
4	To prepare perspective drawing of a small building element.	<b>CO1</b>
4	Site Visit: Any on-going Construction Site of Residential Building (Apartment).	<b>CO1, CO2 CO3</b>
5	Site Visit: Green Building	<b>CO1, CO2 CO3</b>
6	To submit a report on Planning considerations and two line plans of Public Building (on graph paper)	<b>CO1, CO2, CO3</b>
<b>Guidelines for Term-work Assessment</b>		
1. Each experiment from lab journal is assessed for thirty marks based on three rubrics. 2. Rubric R-1 for Timely Completion, R-2 for Understanding and R-3 for Presentation/journal writing where each rubric carries Ten marks.		
<b>Guidelines for Practical Exam</b>		
Practical Exam will be based on Term work assignments		



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<b>S.Y. B. Tech.</b>			
<b>Pattern 2022 Semester: III (B. Tech Civil Engineering)</b>			
<b>CIV222010: Computer Aided Drafting</b>			
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>	
<b>Practical : 02 hrs/week</b>	<b>01</b>	<b>Term work: 25 Marks</b>	
<b>Prerequisite Courses, if any:</b> - Fundamentals of Engineering Graphics, basic information of MS Office and MS Paint			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	<b>Course Outcomes</b>		<b>Bloom's Level</b>
<b>CO1</b>	Explain different commands used in software		2- Understand
<b>CO2</b>	Draw 2D drawings using different commands of software		3- Apply
<b>CO3</b>	Draw floor plan of residential/public building with building components like door, window, arches, etc., using software		3- Apply
<b>CO4</b>	Draw elevation and section of building		3- Apply
<b>CO5</b>	Draw interior/furniture layout of residential building		3- Apply
<b>COURSE CONTENTS</b>			
<b>Unit I</b>	<b>Introduction to Computer Aided Drafting</b>	<b>(05hrs)</b>	<b>COs Mapped - CO1</b>
a) Theory of Computer Aided Drafting: Introduction to Computer Aided Drafting, History of CAD, Various interface of CAD (workspace, Ribbon, model etc.),			
<b>Unit II</b>	<b>Software</b>	<b>(05hrs)</b>	<b>COs Mapped - CO1,CO2</b>
Various commands and their use- Toolbar, Status bar, Panel, Draw, Layers, Annotation, Modify, Blocks, Properties etc., Drawing units and sheet settings			
<b>Unit III</b>	<b>Architectural Drawing and planning</b>	<b>(05hrs)</b>	<b>COs Mapped – CO1, CO2</b>
Introduction to building drawing, different types of building, planning house drawing rough sketch, Drawing different types of residential buildings			
<b>Unit IV</b>	<b>Submission Drawing</b>	<b>(05hrs)</b>	<b>COs Mapped – CO2, CO3, CO4</b>
Drawing of Residential building – ground floor, second floor, (typical floor plan), Elevation and section Construction notes, rainwater harvesting and sewage treatment unit, water supply lines			
<b>Unit V</b>	<b>Furniture Layout</b>	<b>(05hrs)</b>	<b>COs Mapped – CO2, CO4, CO5</b>
Furniture layout planning of residential building- room wise furniture requirement and planning Drawing layout using software			
<b>Text Books</b>			
1. Building Drawing with an Integrated Approach to Built Environment by C.M. Kale, M. G. Shah, S. Y. Patki, MG Graw Hills			
<b>Reference Books</b>			
1. AutoCAD 2020 A Project-Based Tutorial			



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2. AutoCAD 2022 Training Guide: CAD LANGUAGE by Linkan Sagar, BPB Publication

	Strength of CO-PO/PSO Mapping													
	PO												PSO	
<b>CO 1</b>	1	-	2	-	3	-	-	-	1	-	-	3	-	-
<b>CO 2</b>	-	-	2	-	3	-	-	-	1	-	-	3	3	-
<b>CO 3</b>	-	-	2	-	3	-	-	-	1	-	-	3	3	-
<b>CO 4</b>	-	-	2	-	3	-	-	-	1	-	-	3	3	-
<b>CO 5</b>	-	-	2	-	3	-	-	-	1	-	-	3	3	-
<b>Average</b>	-	-	2	-	3	-	-	-	1	-	-	3	3	-

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignments	15
2	LMS Tests	05
	<b>Total</b>	<b>20</b>

List of Laboratory Experiments / Assignments		
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Write a report on Importance of software use for drawings and Terminologies/Commands used in software for 2D Drawings.	CO1, CO2
2	Drawing the Elevation and section of Door (6 paneled double shutter wooden door), Window (Sliding Window) and Arch (Semi-circular) using software	CO2, CO3, CO4
3	Developing typical floor plan of G+1 Residential building using software	CO2, CO3
4	Developing typical furniture layout of G+1 Residential building using software (for assignment no. 3)	CO2, CO5

Guidelines for Laboratory Conduction		
1. Teacher will brief the given assignment to students its procedure, observations calculation, and outcome of this assignment. 2. Software required for the allotted experiment will be provided by the lab assistants using SOP. 3. Students will perform the allotted experiment in a group (fourb students in each group) or individually under the supervision of faculty and lab assistant. 4. After performing the experiment students will check their calculations, drawings from the teacher.		

Guidelines for Term-work Assessment		
1. Each experiment from lab journal is assessed for thirty marks based on three rubrics. 2. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.		



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# **Semester IV**



**K. K. Wagh Institute of Engineering Education and Research, Nashik**  
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S. Y. B. Tech. Pattern 2022 Semester: IV (B. Tech Civil Engineering) CIV222011: Structural Analysis			
Teaching Scheme:	Credit Scheme:	Examination Scheme:	
Theory :03 hrs/week	03	<b>Continuous Comprehensive Evaluation: 20 Marks</b> <b>In Sem Exam: 20 Marks</b> <b>End Sem Exam: 60 Marks</b>	
<b>Prerequisite Courses, if any:</b> - Mathematics, Engineering Mechanics and Mechanics of Structures			
<b>Course Objectives:</b> To apply the basic fundamentals of Engineering Mechanics and Mechanics of structure to estimate internal forces in structures. To understand the structural behavior of indeterminate beams and portal frames and its further application in design of structures.			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	Course Outcomes		Bloom's Level
<b>CO1</b>	Identify determinate and indeterminate structures-static and kinematic for their analysis		2-Understand
<b>CO2</b>	Analyze redundant trusses and perform approximate analysis of multi-story multi-bay frames.		3-Apply
<b>CO3</b>	Solve problems on indeterminate beams and portal frames using slope deflection method.		3-Apply
<b>CO4</b>	Analyze beams and portal frames using moment distribution method.		3-Applyze
<b>CO5</b>	Appraise analysis of beams and portal frames by stiffness Method.		4-Analyze
COURSE CONTENTS			
<b>Unit I</b>	<b>Fundamentals of Structures, Slope and Deflections and Analysis of Indeterminate Beams</b>	<b>(08hrs)</b>	<b>COs Mapped - CO1</b>
a) Basic concept of structural analysis-classification of structures, Concept of indeterminacy-static Kinematic. b) Slopes and deflections in statically determinate beams (Macaulay's method and strain energy method), Joint displacements in trusses by Castigliano's Theorem. c) Analysis of indeterminate beams-fixed beams, continuous beams, propped Cantilevers.			
<b>Unit II</b>	<b>Analysis of Redundant Pin Jointed Frames and Multi-storied Multi-Bay 2-D Rigid Jointed Frames.</b>	<b>(08hrs)</b>	<b>COs Mapped - CO2</b>
a) Analysis of redundant trusses by unit load method for external loading, lack of fit, sinking of support and temperature changes (indeterminacy up to second degree). b) Approximate methods of analysis of multi-storied multi-bay 2-D rigid jointed frames by Cantilever method and Portal method.			
<b>Unit III</b>	<b>Slope Deflection Method</b>	<b>(08hrs)</b>	<b>COs Mapped – CO3</b>
Slope Deflection Method-applications to continuous beams and portal frames (sway & non-sway frame)			



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<b>Unit IV</b>	<b>Moment Distribution Method</b>	<b>(08hrs)</b>	<b>COs Mapped – CO4</b>
Moment Distribution Method-applications to beams and portal frames (sway & non-sway frame), Applications in RCC Design.			
<b>Unit V</b>	<b>Stiffness Method</b>	<b>(08hrs)</b>	<b>COs Mapped – CO5</b>
Stiffness Method-applications to continuous beams, and portal frames (sway & non-sway frame) Applications in RCC Design, software tools, Introduction to finite element method.			
<b>Text Books</b>			
<ol style="list-style-type: none"> <li>Theory of Structures by S. Ramamrutham and R. Narayan, Dhanpat Rai Publishing Company (P) Ltd.</li> <li>Structural Analysis-I &amp; II by S. S. Bhavikatti, Vikas Publishing House Pvt. Ltd.</li> <li>Structural Analysis: A Matrix Approach by G.S.Pandit and S. P. Gupta, Tata McGraw Hill Education Pvt. Limited.</li> </ol>			
<b>Reference Books</b>			
<ol style="list-style-type: none"> <li>Basic Structural Analysis by C. S. Reddy, Tata McGraw Hill Education Pvt. Ltd.</li> <li>Structural Analysis by R. C. Hibbler, Pearson Education.</li> <li>Structural Analysis by Aslam Kassimali, Cengage Learning India Private Limited.</li> <li>Mechanics of Structures Vol. II (Theory and Analysis of Structures) by Dr. H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.</li> </ol>			

<b>Strength of CO-PO Mapping</b>														
	<b>PO</b>												<b>PSO</b>	
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>
<b>CO1</b>	3	3	3	1	-	1	-	3	2	-	-	-	3	3
<b>CO2</b>	3	3	3	1	-	1	-	3	2	-	-	-	3	3
<b>CO3</b>	3	3	3	1	-	1	-	3	2	-	-	-	3	3
<b>CO4</b>	3	3	3	1	-	1	-	3	2	-	-	-	3	3
<b>CO5</b>	3	3	3	1	-	1	-	3	2	-	-	-	3	3
<b>Average</b>	3	3	3	1	-	1	-	3	2	-	-	-	3	3

<b>Guidelines for Continuous Comprehensive Evaluation of Theory Course</b>		
<b>Sr. No.</b>	<b>Components for Continuous Comprehensive Evaluation</b>	<b>Marks Allotted</b>
1	Assignments on Unit-1, Unit-2, Unit-3 & Unit-4	15
2	LMS Tests	05
	<b>Total</b>	<b>20</b>



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S. Y. B. Tech. Pattern 2022 Semester: IV (B. Tech Civil Engineering) CIV222012: Surveying			
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>	
<b>Theory :03 hrs./week</b> <b>Practical (CIV222017) : 04 hrs./week</b>	<b>03</b> <b>02</b>	<b>Continuous Comprehensive Evaluation: 20 Marks</b> <b>In Sem Exam: 20 Marks</b> <b>End Sem Exam: 60 Marks</b> <b>Term work (CIV222017): 25 Marks</b> <b>Practical (CIV222017) : 50 Marks</b>	
<b>Prerequisite Courses:</b> - Knowledge of mathematics, units of measurements of distances and angles.			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	<b>Course Outcomes</b>		<b>Bloom's Level</b>
<b>CO1</b>	Describe the linear & angular measurements.		1-Remember
<b>CO2</b>	Determine the relative elevations of various points on the earth surface.		2-Understand
<b>CO3</b>	Measure horizontal and vertical angles and determine coordinates.		2. Understand
<b>CO4</b>	To Setting out of civil engineering works & to prepare contour map on a given area.		3-Apply
<b>CO5</b>	Design horizontal & vertical curves for highways projects& setting out of curves.		3-Apply
<b>COURSE CONTENTS</b>			
<b>Unit I</b>	<b>Linear Measurements &amp; Angular Measurement</b>	<b>(08 hrs.)</b>	<b>COs Mapped - CO1, CO2</b>
<p>Introduction, Definition, Object of Survey, Primary Division of Surveying, classification of Surveys, Uses of Surveys, Principles of Surveying, Classification of surveying, Units of Measurement (Linear and Angular measure), Scale and R.F. Introduction to instruments required for Measuring distance and Marking of stations. Direct Ranging. Survey stations, Selection of Stations, Base Line, Check Line, Tie Line and Offsets. Booking Field Notes, Field Work: Equipment, Reconnaissance, and Reference Sketches.</p> <p><b>Compass Traversing:</b> Introduction, Open Traverse, Closed Traverse, The Prismatic Compass, Methods of Using Prismatic Compass, Bearing of Lines, Meridians: True, Magnetic, Arbitrary and Grid, Designation of Bearings: Whole Circle System and Quadrantal System, Fore and Back Bearings, Local Attraction, Dip of the Needle, Magnetic Declination.</p>			
<b>Unit II</b>	<b>Levelling</b>	<b>(08 hrs.)</b>	<b>COs Mapped - CO1, CO2</b>
<p><b>Levelling:</b> Object and Use of Levelling, Definitions, Different Types of Levels: Dumpy Level, Auto Level, and Digital Level. Levelling Staff. Temporary Adjustment of Level, Types of Levelling operations; Simple Levelling, Differential Levelling, Fly Levelling, Longitudinal Profile Levelling, Cross-sectional Levelling, Check Levelling. Curvature and Refraction correction. Reciprocal Levelling. Methods of calculation of Reduced level: The collimation System and Rise and Fall system. Permanent Adjustment of Level: Two Peg Test only. Road Project Survey.</p>			



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Unit III	Theodolite Traversing	(08 hrs.)	COs Mapped – CO2, CO3
<p><b>Theodolite Traversing:</b> Study of 20” Vernier Transit Theodolite, Definitions of Terms, Fundamental Lines (Axes) of Theodolite, Conditions of Adjustments, Temporary Adjustments of Theodolite, Measurement of Horizontal Angle by Repetition and Reiteration Method. Measurement of Vertical Angle. Concept of Direct Angles, Deflection Angles. Setting Out an angle, Prolonging a line. Computation of Latitude and Departure. Balancing of traverse: Omitted Measurements</p>			
Unit IV	Tacheometric Survey and Setting of Civil Engineering Works	(08 hrs.)	COs Mapped – CO3, CO4
<p><b>Tachometry:</b> Introduction, Instruments used in tacheometry, Principle of tachometry, Theory of stadia tacheometry, Determination of Tacheometric Constants. Methods of tacheometry: Fixed hair method-when LOS is horizontal or inclined and staff is held vertically. Numerical.</p> <p><b>Contouring:</b> Definition of Contours, Uses of Contour Maps, Characteristics of Contours, Methods of contouring, and Interpolation of Contours.</p> <p>Tachometric contour Survey.</p> <p>Preliminary line out and detailed line out of building, necessary precaution to be taken for line out work.</p>			
Unit V	Curves	(08hrs)	COs Mapped – CO2, CO5
<p>Introduction, different forms of curves. Definitions and explanation of different terms: Degree of curve, relation between radius and degree of curve, super elevation, centrifugal ratio.</p> <p>Types of horizontal curves. Notations used with circular curves. Properties of simple circular curve. Horizontal curve setting by- a) Offsets from chord produced and b) Rankine method of deflection angles. Field procedure for setting out curve (by deflection angle) by one and two theodolite method. Compound Curve- calculation of data and setting out in the field.</p> <p>Transition curves: Objectives of providing transition curves, Requirement of ideal transition curve. Notations used with combined curves.</p> <p>Vertical Curves: Definition, Gradient, rate of change of grade, Length of vertical curve, Types of vertical curves</p>			
<b>Text Books</b>			
<ol style="list-style-type: none"> <li>1. Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S. V. Kulkarni, Pune Vidyarthi Griha Prakashan.</li> <li>2. Surveying, Vol. I &amp; II by Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain, Laxmi Publications.</li> <li>3. Plane Surveying &amp; Higher Surveying by Dr A. M. Chandra, New age international publishers New Delhi.</li> </ol>			
<b>Reference Books</b>			
<ol style="list-style-type: none"> <li>1. Surveying—M. D. Saikia—PHI Learning Pvt .Ltd. Delhi</li> <li>2. Surveying &amp; levelling by R. Subramanian, Oxford Publication.</li> </ol>			



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<b>Guidelines for Continuous Comprehensive Evaluation of Theory Course</b>		
<b>Sr. No.</b>	<b>Components for Continuous Comprehensive Evaluation</b>	<b>Marks Allotted</b>
1	Three Assignments on unit-1 to 5.	15
2	LMS Tests	05
	<b>Total</b>	<b>20</b>



**K. K. Wagh Institute of Engineering Education and Research, Nashik**  
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S. Y. B. Tech. Pattern 2022 Semester: IV (B. Tech Civil Engineering) CIV222013: Concrete Technology			
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>	
<b>Theory :03 hrs/week</b> <b>Practical (CIV222018) : 02 hrs/week</b>	<b>03</b> <b>01</b>	<b>Continuous Comprehensive Evaluation: 20 Marks</b> <b>In Sem Exam: 20 Marks</b> <b>End Sem Exam: 60 Marks</b> <b>Term work (CIV222018): 25 Marks</b> <b>Oral Exam(CIV222018): 25 Marks</b>	
<b>Course Objectives:</b> To know the properties of various ingredients of concrete and concept of mix design To learn the behavior of concrete both in its fresh and hardened state. To understand special concretes and their application. To explain deterioration of concrete and study the methods of repair.			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	<b>Course Outcomes</b>		<b>Bloom's Level</b>
<b>CO1</b>	Discuss concrete as a construction material and get acquainted with the ingredients of concrete like cement, sand, aggregates and admixtures.		2. Understand
<b>CO2</b>	Describe various concreting techniques, special concretes and concrete handling equipment's.		2. Understand
<b>CO3</b>	Discuss and Evaluate the properties of fresh concrete.		3. Apply
<b>CO4</b>	Understand the deteriorations in concrete and categorize different methods and techniques for repairing it.		3. Apply
<b>CO5</b>	Perform concrete mix design for normal concrete grade.		4. Analyze
<b>COURSE CONTENTS</b>			
<b>Unit I</b>	<b>Components of Concrete</b>	<b>(08hrs)</b>	<b>COs Mapped - CO1</b>
Cement and aggregate – Historical note, manufacture of Portland cement, basic chemistry, hydration, physical and mechanical properties, classification, types, application of cement, tests on cement – field tests & laboratory tests. Aggregate: Classifications, Source, mechanical properties, physical properties, deleterious materials, soundness, Alkali – aggregate reaction, Tests on aggregates. Water and admixtures – Quality of water for use in concrete, mixing water, curing water, tests on water. Admixtures: functions, classification, role, types: mineral and chemical like accelerators, retarders, plasticizers, super plasticizers, mineral admixtures – fly ash, silica fume, and ground granulated blast furnace slag.			
<b>Unit II</b>	<b>Fresh and Hardened Concrete</b>	<b>(08hrs)</b>	<b>COs Mapped – CO1,CO2, CO3</b>
Fresh concrete: water – cement ratio, process of manufacturing fresh concrete – batching, mixing, transportation, placing, compaction, curing of concrete, curing methods, workability – factors affecting workability, cohesion and segregation, Bleeding, Laitance, workability tests by slump cone, compaction factor, Vee – Bee consistometer and flow table apparatus, Effect of admixture on workability of concrete and optimum dosage of admixture by Marsh cone test, Influence of temperature, maturity rule.			



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Hardened concrete: Strength of concrete, factors affecting strength, micro – cracking and stress – strain relationship, other strength properties, relation between tensile and compression strength, impact strength, abrasion resistance, elasticity and creep, shrinkage and swelling. Destructive tests – compression strength on cube and cylinder, flexural strength, indirect tensile strength, core test. Nondestructive tests: rebound hammer, ultrasonic pulse velocity

<b>Unit III</b>	<b>Concrete Mix Design</b>	<b>(08hrs)</b>	<b>COs Mapped – CO5,CO1</b>
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Concept and objectives of concrete mix design, factors to be considered, factors affecting the mix design, factors for proportioning of concrete, Statistical quality control, variability of laboratory trial mixes test result and guidelines to improve mix, acceptance criteria, Grade designation and I.S. requirements as per I.S. 456 (Exposure conditions, minimum & maximum cement content and maximum W/C ratio), I.S code method by 10262 and D.O.E. method (with and without mineral admixture)

<b>Unit IV</b>	<b>Concreting Equipments, Techniques and Special Concretes</b>	<b>(08hrs)</b>	<b>COs Mapped - CO3, CO2,CO1</b>
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Batching plants, hauling, pumps, concrete mixers, types of concrete mixers –tilting, non-tilting and reversible drum mixer, concrete vibrators and compaction equipment's, types of vibrators, pumping of concrete, under water concreting, ready mix concrete, roller compacted concrete. Cold weather concreting, hot weather concreting, Light weight concrete and its types, foam concrete, no fines concrete, self-compacting concrete, high density concrete, fiber reinforced concrete, geo – polymer concrete and ferro cement casting technique

<b>Unit V</b>	<b>Durability of Concrete</b>	<b>(08hrs)</b>	<b>COs Mapped – CO4</b>
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Deterioration: permeability and durability, factors affecting the durability of concrete, chemical attack, and sulphate attack by seawater, acid attack, chloride attack, carbonation of concrete and its determination, corrosion of steel and its control

Repairs: Symptoms and diagnosis of distress, evaluation of cracks, selection of repair procedure, repair of defects, common types of repairs, shotcrete, grouting. Introduction of retrofitting of concrete structures by using fiber reinforced polymer (FRP), polymer impregnated concrete and carbon fibers.

**Text Books**

1. Concrete Technology by M. S. Shetty, S Chand, New Delhi-110055.
2. Concrete Technology by M. L. Gambhir, Tata McGraw-Hill.

**Reference Books**

1. Properties of concrete by A. M. Neville, Longman Publishers.
2. Concrete Technology by R.S. Varshney, Oxford and IBH.
3. Concrete technology by A. M. Neville, J.J. Brooks, Pearson.
4. Concrete Mix Design by A. P. Remideos, Himalaya Publishing House.



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<b>Strength of CO-PO Mapping</b>														
	<b>PO</b>												<b>PSO1</b>	<b>PSO2</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>		
<b>CO1</b>	3	-	-	-	-	-	-	-	-	-	-	2	1	1
<b>CO2</b>	1	-	-	-	2	-	1	-	1	-	-	1	1	2
<b>CO3</b>	1	-	-	-	-	-	-	-	-	-	-	-	-	2
<b>CO4</b>	1	2	3	1	2	1	1	-	-	-	-	1	2	1
<b>CO5</b>	1	1	1	1	2	1	1	-	-	-	-	1	1	2
<b>Average</b>	1.4	1.5	2	1	2	1	1	-	1	-	-	1.2	1.25	1.6

<b>Guidelines for Continuous Comprehensive Evaluation of Theory Course</b>		
<b>Sr. No.</b>	<b>Components for Continuous Comprehensive Evaluation</b>	<b>Marks Allotted</b>
1	Four Assignments on Unit-1, Unit-2, Unit 3, Unit-4	15
2	LMS Tests	05
	<b>Total</b>	<b>20</b>



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S. Y. B. Tech.			
Pattern 2022 Semester: IV (B. Tech Civil Engineering)			
CIV222014: Remote Sensing & Geographic Information System			
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>	
<b>Theory :03 hrs/week</b> <b>Practical (CIV222019) : 02 hrs/week</b>	<b>03</b> <b>01</b>	<b>Continuous Comprehensive Evaluation: 20 Marks</b> <b>In Sem Exam: 20 Marks</b> <b>End Sem Exam: 60 Marks</b> <b>Term work (CIV222019): 50 Marks</b>	
<b>Prerequisite Courses, if any:</b> - The basic knowledge of Engineering Mathematic, Physics.			
<b>Course Objectives:</b>			
<ol style="list-style-type: none"> <li>1. To comprehend fundamentals and principles of RS and GIS techniques</li> <li>2. To enhance students' capacity to interpret images and extract information of earth surface from multi-resolution imagery at multi-scale level.</li> <li>3. To study fundamentals and applications of RS and GIS.</li> </ol>			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	<b>Course Outcomes</b>	<b>Bloom's Level</b>	
<b>CO1</b>	Define fundamentals and principles of RS techniques and photogrammetry.	1-Remember	
<b>CO2</b>	Explain fundamentals and applications of GIS.	1-Remember	
<b>CO3</b>	Demonstrate the knowledge of remote sensing and sensor characteristics.	2-Understand	
<b>CO4</b>	Distinguish working of various spaces-based positioning systems.	3-Apply	
<b>CO5</b>	Acquire skills of data processing and its applications using GIS.	4-Analyze	
<b>COURSE CONTENTS</b>			
<b>Unit I</b>	<b>Remote Sensing</b>	<b>(08 hrs.)</b>	<b>COs Mapped - CO1, CO2.</b>
Aerial Photogrammetry Objects, Classification- qualitative & quantitative photogrammetry, Applications, comparison of Map and aerial photographs, Flight Planning , Calculation of no of Photographs. Remote Sensing: Definition and scope, history and development of remote sensing technology, electromagnetic radiation (EMR) and electromagnetic spectrum, EMR interaction with atmosphere and earth surface; atmospheric window, RS platforms, elements of remote sensing for visual interpretation viz. tone, shape, size, pattern, texture, shadow and association.			
<b>Unit II</b>	<b>Remote Sensing Satellites and Sensor Characteristics</b>	<b>(08 hrs.)</b>	<b>COs Mapped - CO1, CO3, CO4.</b>
Satellite types and their characteristics, types of sensors, orbital and sensor characteristics of major earth resource satellites, Indian remote sensing satellite programs, introduction to various open-source satellite data portals, global satellite programs, applications of sensor, concept of Swath & Nadir, digital image. Introduction to spatial resolution, spectral resolution, radiometric resolution and temporal resolution.			
<b>Unit III</b>	<b>Global Positioning System and Global Navigation Satellite System</b>	<b>(08 hrs)</b>	<b>COs Mapped - CO1, CO4.</b>
Introduction to GNSS and Types, IRNSS, GPS, GPS components, differential GPS, types of GPS tracking, application of GNSS in surveying, mapping and navigation.			



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<b>Unit IV</b>	<b>Fundamentals of GIS</b>	<b>(08 hrs)</b>	<b>COs Mapped - CO2, CO5.</b>
Geographic information system, definition, spatial and non-spatial data, data inputs, data storage and retrieval, data transformation, Introduction to cloud computing (types & applications), data reporting, advantages of GIS, essential elements of GIS hardware, software GIS data types, thematic layers and layer combinations, difference between drafting software's and GIS, fundamentals of cartography and map design, applications of RS and GIS in civil engineering.			
<b>Unit V</b>	<b>GIS Data and Applications</b>	<b>(08 hrs)</b>	<b>COs Mapped - CO2, CO5.</b>
GIS data types and data representation, data acquisition, geo-referencing of data, projection systems, raster and vector data, raster to vector conversion, attribute data models and its types, remote sensing data in GIS, GIS database and database management system. Applications of land use and land cover pattern. Case studies.			
<b>Text Books</b>			
1. Remote Sensing & Geographical Information System, M. Anji Reddy, BS Publications, Hyderabad. 2. Remote Sensing & GIS, Basudeb Bhatta, Third Edition, Oxford University Press (New Delhi).			
<b>Reference Books</b>			
1. Remote Sensing & Digital Image Processing, John R. Jensen, Department of Geography University of South Carolina Columbia 2. Remote Sensing and Image Interpretation, Lillesand Thomas M. and Kiefer Ralph, John Wiley 3. Textbook on Remote Sensing, C. S. Agarwal and P. K. Garg, Wheeler Publishing			

<b>Strength of CO-PO Mapping</b>														
	<b>PO</b>												<b>PSO</b>	
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>
<b>CO1</b>	3	3	-	-	3	-	2	-	-	-	-	3	-	-
<b>CO2</b>	3	3	-	-	3	-	2	-	-	-	-	3	-	-
<b>CO3</b>	3	3	-	2	3	-	2	-	-	-	-	3	3	2
<b>CO4</b>	3	3	3	-	3	3	2	-	-	2	-	3	2	-
<b>CO5</b>	3	3	2	2	3	2	2	-	-	-	-	3	2	-
<b>Average</b>	3	3	2.5	2	3	2.5	2	-	-	2	-	3	2.7	2

<b>Guidelines for Continuous Comprehensive Evaluation of Theory Course</b>		
<b>Sr. No.</b>	<b>Components for Continuous Comprehensive Evaluation</b>	<b>Marks Allotted</b>
1	Three Assignments on unit-1 to 4.	15
2	LMS Tests	05
	<b>Total</b>	<b>20</b>



**K. K. Wagh Institute of Engineering Education and Research, Nashik**  
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S. Y. B. Tech. Pattern 2022 Semester: IV (B. Tech Civil Engineering) CIV222015: Earth Sciences		
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>
<b>Theory :03 hrs/week</b>	<b>03</b>	<b>Continuous Comprehensive Evaluation: 20 Marks</b> <b>In Sem Exam: 20 Marks</b> <b>End Sem Exam: 60 Marks</b>
<b>Prerequisite Courses, if any:</b> - To know broadly the various zones of the Earth and shall know the various subtypes of Rocks.		
<b>Course Objectives:</b>		
<ol style="list-style-type: none"> <li>To get the knowledge of the physical properties of mineral and differentiate between the rocks types.</li> <li>To comprehend Structural geology applied to civil engineering projects and to get idea about plate tectonics.</li> </ol>		
<b>Course Outcomes:</b> On completion of the course, students will be able to–		
	<b>Course Outcomes</b>	<b>Bloom's Level</b>
<b>CO1</b>	Get knowledge about the basic concepts of engineering geology.	2.Understand
<b>CO2</b>	Estimation of the importance of mass wasting processes and assessment and Importance of various geological hazards.	2.Understand
<b>CO3</b>	Differentiate and judge between favourable and unfavourable geological conditions for the buildings, roads, dams, tunnels.	3.Apply
<b>CO4</b>	Acquaintance with various types of geological nature at the foundations of dams, tunnels etc and can evaluate the best site.	4. Analyze
<b>CO5</b>	To know various tectonic processes that hampers the design of civil engineering projects and its implications on environment and sustainability.	4. Analyze
<b>COURSE CONTENTS</b>		
<b>Unit I</b>	<b>Interior &amp; General composition of the Earth, Petrology</b>	<b>(08 hrs.)</b> <b>COs Mapped - CO1, CO3.</b>
<p>The Earth as a planet, Interior &amp; General composition of the Earth, The rock cycle. Physical Properties and Classification of Minerals, Rock forming minerals.</p> <p>Various subtypes of igneous rocks, Structures, Textures and Classification of it. Study of common rock types and their engineering applications.</p> <p>Rock weathering, Classification and grain size of secondary rocks ,Textures, Study of common rock types and their civil engineering applications</p> <p>Agents, Types of metamorphism, Texture and structures. Study of common rock types and their civil engineering applications.</p>		
<b>Unit II</b>	<b>Structural Geology</b>	<b>(08 hrs.)</b> <b>COs Mapped – CO2, CO3</b>
<p>Out crop, dip and strike, conformable series, unconformity, its types and overlap, faults and their types, folds and their types, inliers and outlier. Civil engineering importance of faults and folds with examples. Structures of rocks:</p> <p>Igneous intrusions and their types, joints and their types, stratification and lamination.</p>		



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<b>Unit III</b>	<b>Geomorphology</b>	<b>(08 hrs)</b>	<b>COs Mapped – CO2, CO3.</b>
<p>Endogenic and Exogenic processes, Geological action by river and Landforms formed due to this, Aeolian and glacial process, Coastal geomorphology.</p> <p>General principles of Stratigraphy, Geological time scale w.r.t. Indian geological time scale, Physiographic divisions of India, various stratigraphical systems in Indian Geology and effects of their structural characters on major civil engineering activities. Volcanism, Earthquakes &amp; Seismic zones of India, Landslides and stability of hill slopes and preventive measures against it.</p>			
<b>Unit IV</b>	<b>Preliminary Geological Studies and Ground Water</b>	<b>(08 hrs)</b>	<b>COs Mapped – CO4, CO5.</b>
<p>Reconnaissance survey, Desk Study, surface and subsurface Geological Investigations, Direct and Indirect methods, core drilling and various terminology associated with core drilling methods, core inspection significance and limitations of it. Types of ground water, water table and depth zones, influence of hydro geological properties of rocks, types of aquifers, artesian wells and its geological conditions, artificial recharge of groundwater. Geological work of groundwater, levels, effects of dams and canals, effect of pumping, cone of depression, circle of influence, fluctuations in water table, Methods of conservation of groundwater and its management; introduction of watershed management.</p>			
<b>Unit V</b>	<b>Applied Geology</b>	<b>(08 hrs)</b>	<b>COs Mapped - CO2, CO4, CO5.</b>
<p>Strength, stability and water tightness of foundation rocks, influence of geological conditions on the choice and type of dam, preliminary geological work on dam and reservoir sites, precautions to be taken to counteract unsuitable conditions and their relevant treatments with case studies.</p> <p>Tunneling: Preliminary geological investigations, important geological considerations while choosing alignment, difficulties during tunneling as encountered due to various geological conditions, Role of groundwater and suitability of common rock types for excavation and tunneling and important case studies in Kasara and Bor Ghat sections of central railway in Maharashtra, in Himalayas etc.</p> <p>Building stones: Requirements of good building stone: strength, durability, ease of dressing, appearance, mineral composition, textures and field structures, suitability of common rocks as building stone.</p>			
<b>Text Books</b>			
<p>1. Text Book of Engineering Geology by R.B. Gupte , 2001, P.V.G. Publications, Pune. 2. A Text Book of Engineering Geology by N. Chenna Kesavulu. 2010, McMillan India Ltd. 3. Principles of Engineering Geology by D. Venkat Reddy. 2010, Vikas Publishers</p>			
<b>Reference Books</b>			
<p>1. Geology P. K. Mukerjee, World Press 2. Engineering Geology by F. G. H Blyth and De Frietus, Reed Elsevier India 3. Geology for geotechnical engineers, J. C. Harvey, Cambridge University Press 4. Principals of Engineering Geology, S.K. Garg, VikasPublishe 5. Engineering Geology, Parbin Singh 6. Geology and Engineering, K. V. G. K. Gokhale, D. M. Rao ,Tata McGraw Hill. 7. Structural Geology, M. P. Billings, Pearson India Pvt. Ltd.</p>			



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Strength of CO-PO Mapping														
	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
<b>CO1</b>	3	2	--	--	--	3	3	3	2	3	1	2	-	1
<b>CO2</b>	3	3	3	--	--	3	3	2	2	2	1	1	2	-
<b>CO3</b>	3	3	3	2	--	3	3	2	3	3	--	--	2	2
<b>CO4</b>	3	3	3	3	1	2	2	2	2	2	3	1	3	2
<b>CO5</b>	3	3	3	1	1	2	2	2	2	2	2	1	3	3
<b>Average</b>	3	2.8	3	2	1	2.6	2.6	2.2	2.2	2.4	1.7	1.25	2.5	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Three Assignments on unit-1 to 4.	15
2	LMS Tests	05
	<b>Total</b>	<b>20</b>



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S. Y. B. Tech. Pattern 2022 Semester: IV (B. Tech Civil Engineering) CIV222016: Softwares in Civil Engineering			
Teaching Scheme:	Credit Scheme:	Examination Scheme:	
Theory :01 hr/week	---	---	
<b>Course Objectives:</b>			
1. To understand the basics of computer softwares used in civil engineering. 2. To understand the tools of various computer software. 3. To develop the computer based skills which are used in civil engineering.			
<b>Course Outcomes:</b> On completion of the course, students will be able to–			
	Course Outcomes	Bloom's Level	
<b>CO1</b>	Understand the basics of Excel.	2- Understand	
<b>CO2</b>	Understand the basics BIM, Primavera and MS Project.	2- Understand	
<b>CO3</b>	Understand the analysis and design of structural elements using Etabs and Staad Pro.	2- Understand	
<b>CO4</b>	Understand the analysis and design the foundation using Safe and plaxis.	2- Understand	
<b>CO5</b>	Develop the architectural plan by using Autocad.	3- Apply	
COURSE CONTENTS			
Unit I	Data Management	(02hrs)	COs Mapped - CO1
Introduction Microsoft Excel, Rows and Columns operations, Data Entry, Formulas, Graphs formation and Application.			
Unit II	Introduction to computer aided drafting and 2D Planning	(02hrs)	COs Mapped – CO5
Introduction to Autocad, Reasons for implementing CAD, Design process, Applications of computers to design, Benefits of computer Aided design.			
Unit III	Project Management Tools	(02hrs)	COs Mapped – CO3,CO2
Introduction to BIM, Primavera and MS Project, Advantages, Applications – <b>Planning</b> , Monitoring, Controlling, and Reporting a project.			
Unit IV	Structural Analysis and Design Tools	(02hrs)	COs Mapped – CO4
Introduction to Etabs and Staad Pro, Modelling, <b>Range of Design Codes</b> and Design process, Applications.			
Unit V	Analysis and Design Tools For Foundation	(02hrs)	COs Mapped – CO3
Introduction to Safe and Plaxis, Modelling and Design process, Applications.			



**K. K. Wagh Institute of Engineering Education and Research, Nashik**  
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**Text Books**

1. **G. Harvey. (2019).** Excel 2019 All-in-One For Dummies. For Dummies, ISBN-10 111951794X.
2. **P. Harris. (2015).** Planning and Control Using Oracle Primavera P6 Versions 8.1 to 15.1 PPM Professional ISBN-101925185192.
3. **C. Chatfield and T. Johnson** Microsoft Project 2016 Step by Step. Microsoft Press. 0735698740
4. **T. S. Sharma. (2016)** Design of R C C Buildings using Staad Pro V8i with Indian Examples. Ebooks2go Inc, ISBN: 9781545709160

**Reference Books**

1. Khan, Irshad & George, Josy & Yadav, Anil. (2020). Autocad Handbook for Practice.
2. Pharne, Pravin & Wagdare, Nagesh & Limbone, Nilesh & Gaikwa, Jivan. (2022). Project Management Using Primavera P6. International Journal for Research in Applied Science and Engineering Technology. 10. 3174-3178..

**Strength of CO-PO Mapping**

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
<b>CO1</b>	2	1	3	-	3	-	2	1	3	-	-	3	-	-
<b>CO2</b>	2	1	3	-	3	1	2	1	3	1	1	3	-	-
<b>CO3</b>	2	2	3	-	3	1	2	1	3	1	3	3	-	-
<b>CO4</b>	2	2	3	-	3	1	2	1	3	1	1	3	-	-
<b>CO5</b>	2	2	3	-	3	1	2	1	3	1	2	3	-	-
<b>Average</b>	2	2	3	-	3	1	2	1	3	1	1	3	-	-



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<b>S. Y. B. Tech.</b> <b>Pattern 2022 Semester: IV (B. Tech Civil Engineering)</b> <b>CIV222017: Surveying Lab</b>		
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>
<b>Practical : 04 hrs./week</b>	<b>02</b>	<b>Term work : 25 Marks</b> <b>Practical : 50 Marks</b>
<b>Prerequisite Courses:</b> - Knowledge of mathematics, units of measurements of distances and angles.		
<b>Course Outcomes:</b> On completion of the course, students will be able to–		
	<b>Course Outcomes</b>	<b>Bloom's Level</b>
<b>CO1</b>	Describe the linear & angular measurements.	1-Remember
<b>CO2</b>	Describe modern equipments like GIS, GPS & their applications in surveying.	2-Understand
<b>CO3</b>	Determine the relative elevations of various points on the earth surface & to prepare contour map on a given area.	2. Understand
<b>CO4</b>	Design horizontal & vertical curves for highways projects& setting out of curves.	3-Apply

<b>List of Laboratory Experiments / Assignments</b>		
<b>Sr. No.</b>	<b>Laboratory Experiments / Assignments</b>	<b>CO Mapped</b>
1	Measurement of magnetic bearings of sides of a triangle or polygon, correction for local attraction and calculations of true bearings using prismatic compass.	<b>CO1</b>
2	Simple and differential leveling with at least three change points using digital level.	<b>CO2</b>
3	Plane table survey by Radiation & Intersection method.	<b>CO1</b>
4	Measurement of horizontal angles (by repetition method) using Vernier Transit Theodolite.	<b>CO1, CO3</b>
5	Measurement of vertical angles by vernier transit theodolite	<b>CO2, CO3</b>
6	Finding horizontal distance and vertical elevation using a Tacheometer	<b>CO3</b>
7	Brief Introduction to City Survey.	<b>CO4</b>
8	<b>Project I:</b> Road project using Auto level for a minimum length of 500 m including fixing of alignment, profile leveling, cross-sectioning, plotting of L section and Cross Section. (Full imperial sheet including plan, L-section and any three typical Cross-sections).	<b>CO2,CO3, CO4</b>
9	<b>Project II:</b> Tachometric contouring project on hilly area with at least two instrument stations about 60 m to 100 m apart and generating contours using both methods manual as well as using any suitable software such as Autodesk land desktop, Auto-civil, Foresight etc. (minimum contour interval 1 meter).	<b>CO4</b>
10	<b>Project III:</b> Total Station – Area measurement	<b>CO2, CO4</b>



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<b>Guidelines for Laboratory Conduction</b>
<ol style="list-style-type: none"><li>1. Teacher will brief the given experiment to students its procedure, observations calculation, and outcome of this experiment.</li><li>2. Apparatus and equipment's required for the allotted experiment will be provided by the lab assistants using SOP.</li><li>3. Students will perform the allotted experiment in a group (two students in each group) under the supervision of faculty and lab assistant.</li><li>4. After performing the experiment students will check their readings, calculations from the teacher.</li><li>5. After checking they have to write the conclusion of the final result.</li></ol>
<b>Guidelines for Student's Lab Journal</b>
Write-up should include title, aim, and diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.
<b>Guidelines for term work Assessment</b>
<ol style="list-style-type: none"><li>1. Each experiment from lab journal is assessed for thirty marks based on three rubrics.</li><li>2. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.</li></ol>



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S. Y. B. Tech. Pattern 2022 Semester: IV (B. Tech Civil Engineering) CIV222018: Concrete Technology Lab		
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>
<b>Practical: 02 hrs/week</b>	<b>01</b>	<b>Term work : 25 Marks</b> <b>Oral Exam: 25 Marks</b>
<b>Course Objectives:</b>		
1. To know the properties of various ingredients of concrete and concept of mix design 2. To learn the behavior of concrete both in its fresh and hardened state. 3. To understand special concretes and their application. 4. To explain deterioration of concrete and study the methods of repair.		
<b>Course Outcomes:</b> On completion of the course, students will be able to–		
	<b>Course Outcomes</b>	<b>Bloom's Level</b>
<b>CO1</b>	Discuss concrete as a construction material and get acquainted with the ingredients of concrete like cement, sand, aggregates and admixtures.	2. Understand
<b>CO2</b>	Describe various concreting techniques, special concretes and concrete handling equipment's.	2. Understand
<b>CO3</b>	Discuss and Evaluate the properties of fresh concrete.	3. Apply
<b>CO4</b>	Understand the deteriorations in concrete and categorize different methods and techniques for repairing it.	3. Apply
<b>CO5</b>	Perform concrete mix design of normal concrete grade.	4. Analyze

List of Laboratory Experiments / Assignments		
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Fineness and standard consistency of cement.	<b>CO1,CO2</b>
2	Initial and final setting time and soundness of cement.	<b>CO1, CO2</b>
3	Compressive strength of cement.	<b>CO1, CO2</b>
4	Moisture content, silt content, Density and Specific gravity of fine aggregate	<b>CO1, CO2</b>
5	Fineness modulus by sieve analysis of fine aggregate.	<b>CO1, CO2</b>
6	Moisture content, water absorption, density and Specific gravity of coarse aggregate	<b>CO1, CO2</b>
7	Fineness modulus by sieve analysis and gradation of Coarse aggregates	<b>CO1, CO2</b>
8	Workability of fresh concrete (with and without admixture) by slump Cone test, compaction factor, Vee Bee consistometer test	<b>CO2,CO3</b>
9	Compressive strength test (Cube, Cylinder) of hardened concrete by Direct and indirect test.	<b>CO2, CO3</b>
10	Flexural strength test on beam	<b>CO2, CO3</b>
11	Concrete mix design by IS code method	<b>CO1, CO5</b>
12	Site visit to any RMC plant / On going construction	<b>CO1,CO2,C O3</b>



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**Guidelines for Laboratory Conduction**

1. Teacher will brief the given experiment to students its procedure, observations calculation, and outcome of this experiment.
2. Apparatus and equipments required for the allotted experiment will be provided by the lab assistants using SOP.
3. Students will perform the allotted experiment in a group (5 students in each group) under the supervision of faculty and lab assistant.
4. After performing the experiment students will check their readings, calculations from the teacher.
5. After checking they have to write the conclusion of the final result.

**Guidelines for Student's Lab Journal**

Write-up should include title, aim, diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.

**Guidelines for Termwork Assessment**

1. Each experiment from lab journal is assessed for thirty marks based on three rubrics.
2. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.



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<b>S. Y. B. Tech.</b> <b>Pattern 2022 Semester: IV (B. Tech Civil Engineering)</b> <b>CIV222019: Remote Sensing &amp; Geographic Information System Lab</b>		
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>
<b>Practical : 02 hrs/week</b>	<b>01</b>	<b>Term work : 50 Marks</b>
<b>Prerequisite Courses, if any:</b> - The basic knowledge of Engineering Mathematic, Physics.		
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>1. To comprehend fundamentals and principles of RS and GIS techniques</li> <li>2. To enhance students' capacity to interpret images and extract information of earth surface from multi-resolution imagery at multi-scale level.</li> <li>3. To study fundamentals and applications of RS and GIS.</li> </ol>		
<b>Course Outcomes:</b> On completion of the course, students will be able to–		
	<b>Course Outcomes</b>	<b>Bloom's Level</b>
<b>CO1</b>	Identify the land use and land cover classification.	1. Remember
<b>CO2</b>	Understand the various methods of visual image interpretation.	2. Understand
<b>CO3</b>	Explain the function of various tools of QGIS software.	3. Apply
<b>CO4</b>	Prepare the thematic maps of different features.	2. Apply

<b>List of Laboratory Experiments / Assignments</b>		
<b>Sr. No.</b>	<b>Laboratory Experiments / Assignments</b>	<b>CO Mapped</b>
1	Study of fundamental tools of software for data processing	<b>CO3</b>
2	Geo-reference and Geo-tag using Google earth/ base map	<b>CO3</b>
3	Digitize the given part of toposheet using software & attribute (Name, area, length, as per requirements).	<b>CO2, CO4</b>
4	Generation of thematic maps (contour, drainage, road etc.) in software.	<b>CO4</b>
5	Visual image interpretation from aerial photos and/or satellite images.	<b>CO2</b>
6	Import and export data GIS software to the Auto-CAD or Revit software and mention all the necessary steps used.	<b>CO3</b>
7	Preparation of DEM to study geomorphological features and nature of slope.	<b>CO4</b>
8	Land use classification using RS data.	<b>CO4</b>
9	Explore utilization of RS and GIS for development of smart city.	<b>CO4</b>



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<b>Guidelines for Laboratory Conduction</b>
<ol style="list-style-type: none"><li>1. Teacher will brief the given experiment to students its procedure, tools, and outcome of the practical.</li><li>2. Computers and software required for the allotted experiment will be provided by the lab assistants using SOP.</li><li>3. Students will perform the allotted practical individually under the supervision of faculty and lab assistant.</li><li>4. After performing the practical students will check their images/processing from the teacher.</li><li>5. After checking they have to write the outcome of the practical.</li></ol>
<b>Guidelines for Student's Lab Journal</b>
Write-up should include title, aim, diagram, procedure, tools, graphs, symbols, images and questions, if any.
<b>Guidelines for Termwork Assessment</b>
<ol style="list-style-type: none"><li>1. Each experiment from lab journal is assessed for thirty marks based on three rubrics.</li><li>2. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.</li></ol>



**K. K. Wagh Institute of Engineering Education and Research, Nashik**  
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S. Y. B. Tech. Pattern 2022 Semester: IV (B. Tech Civil Engineering) CIV222020: Project Based Learning		
<b>Teaching Scheme:</b>	<b>Credit Scheme:</b>	<b>Examination Scheme:</b>
<b>Practical :02 hrs/week</b>	<b>01</b>	<b>Tern work: 25 Marks</b>
<b>Course Objectives:</b>		
1. To create student's interest in learning through various project ideas in civil engineering. 2. To develop creativity, research attitude, skills required project work. 3. To incorporate the technical knowledge in solving of real life problems in civil engineering.		
<b>Course Outcomes:</b> On completion of the course, students will be able to–		
	<b>Course Outcomes</b>	<b>Bloom's Level</b>
<b>CO1</b>	To identify the social needs and real life problems in civil engineering	2-Understand
<b>CO2</b>	To generate ideas and decide the most optimized alternative in practice.	3-Apply
<b>CO3</b>	To utilize various tools to solve the identified problem.	4-Analyse
<b>COURSE CONTENTS</b>		
Introduction to Project Based Learning, Why PBL?, applications and research trends, case studies in Civil Engineering. Introduction to design thinking and ideation. Introduction of various thrust areas in Civil Engineering. Sample case studies in Civil Engineering. Introduction of patents, copyright, publications etc.		<b>COs mapped CO1, CO2, CO3</b>
<b>Guidelines for Conduction</b>		
Subject faculty will conduct the sessions on course content of PBL. Faculty will form small groups of students. Each group has to select one problem in field of civil engineering and decide the topic of project. Topics will be based on study, identification of problems and improvement in existing systems in Civil Engineering, generation of new ideas for development of engineering systems to solve field problems. A mentor/guide will be assigned to each group. Students will work on the topic using various analytical/mathematical/ICT tools, case studies etc. and will submit a report at the end of semester.		
<b>Guidelines for Student's PBL Report</b>		
<b>Sequence of pages:</b>		
i) Front Cover Page ii) Certificate iii) Acknowledgement iv) Abstract v) Contents vi) List of Figures vii) List of Tables viii) Abbreviations		
<b>Chapter 1</b> Introduction (Introduction , Problem Statement, Objectives , Scope of the Project Works, Expected outcomes)		
<b>Chapter 2</b> Literature Review (It shall include theoretical support, details regarding work done by Earlier research, methods established any new approach)		
<b>Chapter 3</b> Planning Schedule/ Flow Chart for Completion of Project		
<b>Chapter 4</b> Conclusion		
References and Bibliography		
<b>Report Printing details:</b>		
1. Report shall be typed on A4 size Executive Bond paper with single spacing preferably on <b>Both</b> sides of paper.		
2. Margins: Left Margin: 37.5 mm, Right Margin: 25 mm, Top Margin: 25 mm, Bottom Margin: 25 mm.		
3. Give page number at bottom margin at center.		
4. Size of Letters: Chapter Number: 16 font size, Times New Roman in Capital Bold Letters,		



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Chapter Name: 12 Font size in Capital Bold Letters, Main Titles (1.1, 2.5 etc): 16 Font size in Bold Letters Sentence case, Sub Titles (1.1.5, 4.5.1 etc): 14 Font size in Bold Letters Sentence case. All other matter: 12 Font size sentence case.

5. No blank sheet be left in the report.

6. Figure name: 12 Font size in sentence case Bold- Below the figure.

7. Table title -12 font size in sentence case- Bold-Above the table.

**Guidelines for Termwork Assessment**

A continuous assessment will be done by Subject Faculty/Mentor/Guide. Assessment will be based on Problem Identified, Idea generated, Methodology to implement the project, Involvement in a group, presentation/demonstration and PBL report.

**Reference Books**

M. Savin-Baden and C. Howell Major, Foundations of Problem-based Learning. McGraw-Hill Education, 2004

**Website for references**

1. [www.pblwork.org](http://www.pblwork.org)
2. [www.my.pblworks.org](http://www.my.pblworks.org)
3. [www.swayam.gov.in/nd2\\_ntr20\\_ed12/preview](http://www.swayam.gov.in/nd2_ntr20_ed12/preview)

<b>Strength of CO-PO Mapping</b>														
	<b>PO</b>												<b>PSO</b>	
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>
<b>CO1</b>	3	3	3	2	2	2	2	2	3	3	2	3	3	2
<b>CO2</b>	3	3	3	2	2	2	2	2	3	3	2	3	3	2
<b>CO3</b>	3	3	3	2	2	2	2	2	3	3	2	3	3	2
<b>Average</b>	3	3	3	2	2	2	2	2	3	3	2	3	3	2