



**D Y P A T I L**  
COLLEGE *of*  
ENGINEERING & TECHNOLOGY  
(AN AUTONOMOUS INSTITUTE)  
KASABA BAWADA, KOLHAPUR



# **D. Y. Patil College of Engineering and Technology**

**Kasaba Bawada, Kolhapur  
(An Autonomous Institute)**

**Accredited by NAAC with 'A' Grade**

**S. Y. B. Tech. Syllabus**

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**Department of Civil Engineering**  
(with effect from academic year 2023-24)

**D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY, KOLHAPUR**

Teaching and Evaluation Scheme from Year 2023-24

**Second Year B. Tech. Civil Engineering**

**SEMESTER-III**

Sr. No	Course Code	Course Type	Name of the Course	Teaching Scheme Per Week			Credits	Total Marks	Evaluation scheme			
				Lecture Hours	Tutorial Hours	Practical Hours			Type	Max. Marks	Min. Marks for Passing	
1	201CEL201	BSC	Applied Mathematics	3	1	0	4	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
2	201CEL202	PCC	Mechanics of Structures	3	0	0	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
3	201CEL203	PCC	Concrete Technology	3	0	0	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
4	201CEL204	PCC	Fluid Mechanics	3	0	0	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
5	201CEL205	ESC	Building Construction and Drawing	3	0	0	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
6	201CEP206	PCC-LC	Mechanics of Structures Lab	0	0	2	1	25	ISE	25	10	
7	201CEP207	PCC-LC	Concrete Technology Lab	0	0	2	1	50	ISE	25	10	
									ESE (OE)	25	10	
8	201CEP208	PCC-LC	Fluid Mechanics Lab	0	0	2	1	50	ISE	25	10	
									ESE (OE)	25	10	
9	201CEP209	ESC-LC	Building Construction and Drawing Lab	0	0	4	2	75	ISE	50	20	
									ESE (OE)	25	10	
<b>Total</b>				<b>15</b>	<b>1</b>	<b>10</b>	<b>21</b>	<b>700</b>				
<b>Summary</b>		<b>Total Contact Hrs/week</b>		<b>26</b>			<b>Total Credits</b>		<b>21</b>	<b>Total Marks</b>		<b>700</b>

*ISE: In Semester Evaluation MSE: Mid Semester Examination ESE: End Semester Examination*

*OE- Oral Examination*

**Note 1 :** Tutorials and practical shall be conducted in batches with batch strength not exceeding 20 students.

**Note 2 :** ESE will be conducted for 100 marks and converted to 50 Marks

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Teaching and Evaluation Scheme from Year 2023-24

**Second Year B. Tech. Civil Engineering**

**SEMESTER-IV**

Sr. No	Course Code	Course Type	Name of the Course	Teaching Scheme Per Week			Credits	Total Marks	Evaluation scheme			
				Lecture Hours	Tutorial Hours	Practical Hours			Type	Max. Marks	Min. Marks for Passing	
1	201CEL211	PCC	Structural Analysis	3	1	0	4	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
2	201CEL212	PCC	Geotechnical Engineering	3	0	0	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
3	201CEL213	ESC	Building Planning and Design	3	0	0	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
4	201CEL214	PCC	Engineering Surveying	3	0	0	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
5	201CEL215	PCC	Open Channel Hydraulics & Hydraulic Machines	3	0	0	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
6	201CEP216	PCC-LC	Geotechnical Engineering Lab	0	0	2	1	50	ISE	25	10	
									ESE (OE)	25	10	
7	201CEP217	ESC-LC	Building Planning and Design Lab	0	0	2	1	50	ISE	25	10	
									ESE (OE)	25	10	
8	201CEP218	PCC-LC	Engineering Surveying Lab	0	0	2	1	50	ISE	25	10	
									ESE (OE)	25	10	
9	201CEP219	PCC-LC	Open Channel Hydraulics & Hydraulic Machines Lab	0	0	2	1	25	ISE	25	10	
10	201CEMC 220	MC	Environmental Studies (Mandatory Course-III)	2	0	0	0	50	ESE	50	20	
<b>Total</b>				<b>17</b>	<b>1</b>	<b>8</b>	<b>20</b>	<b>725</b>				
<b>Summary</b>				<b>Total Contact Hrs/week</b>			<b>Total Credits</b>		<b>20</b>	<b>Total Marks</b>		<b>725</b>

*ISE: In Semester Evaluation MSE: Mid Semester Examination ESE: End Semester Examination  
OE- Oral Examination*

**Note 1 :** Tutorials and practical shall be conducted in batches with batch strength not exceeding 20 students

**Note 2 :** ESE will be conducted for 100 marks and converted to 50 Marks



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**Second Year B. Tech. Civil Engineering**

**SEM-III (Academic Year-2023-24)**

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**Course Plan**

<b>Course Title: Applied Mathematics</b>	
<b>Course Code: 201CEL201</b>	<b>Semester: III</b>
<b>Teaching Scheme: L-T-P : 3-1-0</b>	<b>Credits: 4</b>
<b>Evaluation Scheme: ISE + MSE Marks : 20 + 30</b>	<b>ESE Marks: 50</b>

**Course Description:**

The course contains Differential Equations, Vector Calculus, Statistics, Laplace Transform and Integral Calculus.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfill the needs of society.

**Course Objectives:**

- 1 To develop mathematical skills and enhance thinking power of students.
- 2 To give the knowledge to the students of Applied Mathematics with an emphasis on the application of solving civil engineering problems.
- 3 To prepare students to formulate a mathematical model using engineering skills & interpret the solution in civil engineering and real world.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C201.1	Apply linear differential equation to solve the civil engineering problems
C201.2	Compute gradient, divergence and curl of vector differentiation
C201.3	Make use of lines of regression and curve fittings to Describe the statistical data numerically
C201.4	Solve basic problems in probability theory, including problems involving the Binomial, Poisson, and Normal distributions.
C201.5	Apply Laplace transform to solve linear differential equations
C201.6	Calculate numerical integration by numerical methods.

<b>Prerequisite:</b>	Methods to solve quadratic equation, synthetic division method, partial fraction formulae of derivatives, derivative and integration formulae, basic probability.
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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C201.1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3
C201.2	3	1	-	-	-	-	-	-	-	-	-	-	-	-	3
C201.3	3	1	-	-	2	-	-	-	-	-	-	-	-	-	3
C201.4	3	1	-	-	-	-	-	-	-	-	-	-	-	-	3
C201.5	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3
C201.6	3	1	-	-	2	-	-	-	-	-	-	-	-	-	3



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<b>Course Content</b>	<b>Hours</b>
<p><b>Unit 1. Linear Differential Equations and Its Applications</b></p> <p>Linear differential equations with constant coefficients.</p> <p>Rules to find complementary function.</p> <p>Methods to find particular integral (<math>X=e^{ax}</math>, <math>\sin ax/\cos ax</math>, <math>x^n</math>, <math>e^{ax}V</math>)</p> <p>Applications of linear differential equations to Cantilever, Strut, Beam.</p>	<b>6</b>
<p><b>Unit 2. Vector Differential Calculus</b></p> <p>Differentiation of vectors.</p> <p>Gradient of scalar point function.</p> <p>Divergence of vector point function</p> <p>Curl of a vector point function.</p> <p>Irrotational, solenoidal and scalar potential function of a vector field.</p>	<b>6</b>
<p><b>Unit 3. Correlation, Regression &amp; Curve Fitting</b></p> <p>Introduction.</p> <p>Lines of regression of bivariate data.</p> <p>Fitting of curves by method of least-squares:</p> <p>Fitting of straight lines.</p> <p>Fitting of second degree parabolic curves.</p>	<b>6</b>
<p><b>Unit 4. Probability Distribution</b></p> <p>Random variables.</p> <p>Discrete probability distribution.</p> <p>Continuous probability distribution.</p> <p>Binomial distribution.</p> <p>Poisson distribution.</p> <p>Normal distribution.</p>	<b>6</b>



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<p><b>Unit 5. Laplace Transform and its Applications</b></p> <p>Laplace transform of elementary functions</p> <p>First shifting property</p> <p>Change of scale property</p> <p>Multiplication by <math>tn</math> property</p> <p>Division by <math>t</math> property</p> <p>Introduction to Inverse Laplace transform, standard formulae.</p> <p>Inverse Laplace transform by method of partial fraction</p> <p>Solution of linear differential equation with constant coefficients using Laplace transform</p>	<b>6</b>
<p><b>Unit 6. Numerical Methods- Numerical Integration</b></p> <p>Trapezoidal Rule</p> <p>Simpson's 1/3 rd rule</p> <p>Simpson's 3/8 th rule</p> <p>Weddle's Rule</p>	<b>6</b>

**Tutorials**

Sr. No.	Title	Hours
1	Linear Differential Equations	1
2	Applications Linear Differential Equations	1
3	Vector Differential Calculus	1
4	Correlation, Regression & Curve Fitting	1
5	Probability Distribution	1
6	Laplace Transform and its Applications	1
7	Inverse Laplace Transform	1
8	Numerical Integration	1
9	Fitting of first and second degree curves using SCILAB/MATLAB	1
10	Trapezoidal and Simpson's Rule using SCILAB/MATLAB	1



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**Text Books:**

1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publication, New Delhi, 40 <sup>th</sup> Edition, 2007
2	H. K. Dass, Advanced Engineering Mathematics, S. Chand, New Delhi
3	N.P. Bali, Manish Goyal, A Text Book of Engineering Mathematics, LaxmiPublication, New Delhi, 7 <sup>th</sup> Edition, 2007
4	P.N. Wartikar & J.N. Wartikar, A Text Book of Applied Mathematics Vol I & II., Pune Vidyarthi Griha Prakashan, Pune

**Reference Books:**

1	Erwin Kreyszig, Advanced Engineering Mathematics, India Pvt, Ltd
2	B. V. Ramana, Higher Engineering Mathematics, Tata M/c Graw-Hill Publication.
3	M. K. Jain, Numerical methods for Scientific and Engineering Computation, New Age International Pvt. Ltd, New Delhi.





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**Course Plan**

<b>Course Title: Mechanics of Structures</b>	
<b>Course Code: 201CEL202</b>	<b>Semester: III</b>
<b>Teaching Scheme: L-T-P : 3-0-0</b>	<b>Credits: 3</b>
<b>Evaluation Scheme: ISE + MSE Marks : 20 + 30</b>	<b>ESE Marks: 50</b>

**Course Description:**

The students learned Applied Mechanics to study the external effects on the body due to action of force system in First Year. The knowledge of behaviour of structure under different loading conditions is required so that structural design can be done by the Civil Engineer. In this course, analysis of determinate structures under action of transverse loading, along with, analysis of members under direct loading is to be studied. Analysis of Industrial Trusses is also incorporated to give an idea of typical structures to the students. The Structural Mechanics will enable the student to analyze Steel and Concrete Structures used in construction.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfill the needs of society.

**Course Objectives:**

- 1 To learn the fundamental concepts of stress, strain, and deformation of solids under external forces for determinate structural members
- 2 To learn the bending moment, shear force and the corresponding stress distribution for different types of determinate beams.
- 3 To understand the nature of stresses developed in simple geometries for various types of loads
- 4 To show the plane stress transformation with a particular coordinate system for different orientation of the plane.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C202.1	Apply the concepts and principles of stresses, strains and elastic behaviour of materials.
C202.2	Analyze the behavior of the solid bodies subjected to various types of loadings
C202.3	Apply the concepts of ILD and moving loads on determinate structures and the concept of equivalent UDL
C202.4	Evaluate the stresses, strains resulting from elastic stresses developed within the materials for different orientation of the plane.

<b>Prerequisite:</b>	Engineering Mechanics
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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C202.1	3	2	-	-	-	-	-	-	-	-	-	-	1	-	3
C202.2	3	3	-	2	-	-	-	-	-	-	-	1	1	1	4
C202.3	2	2	-	-	-	-	-	-	-	-	-	-	-	1	4
C202.4	2	3	-	-	-	-	-	-	-	-	-	-	-	1	4



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<b>Content</b>	<b>Hours</b>
<p><b>Unit 1. Stresses &amp; Strains</b></p> <p>Elasticity and plasticity – Concept of axial stresses (compression, tension), strains(linear, lateral, shear and volumetric)–Hooke’s law–Stress-strain diagram of ductile and brittle materials – Elastic limit, Ultimate stress, Yielding, Modulus of elasticity – Factor of safety – Poisson’s ratio and volumetric strain – Principle of superposition - Composite sections - Elastic constants and their relations – Stresses and strains due to change in temperature.</p>	6
<p><b>Unit 2. Shear force and Bending Moment Diagrams</b></p> <p>Definition of beam – Types – Concept of shear force and bending moment – S.F and B.M diagrams for determinate beams due to concentrated, uniformly distributed, uniformly varying loads, couples and combination of these loads – Point of contra flexure – Relation between S.F., B.M and intensity of loading</p>	6
<p><b>Unit 3. Rolling Loads And Influence Lines</b></p> <p>Rolling loads – Single concentrated load – Uniformly distributed load – Two concentrated loads – Curves of maximum Bending Moment diagram and Shear Force Diagram– Equivalent Uniformly Distributed Load - Influence line for statically determinate beams and arches for bending moment and shear force due to concentrated and uniformly distributed loads</p>	6
<p><b>Unit 4. Theory of Simple Bending</b></p> <p><b>Flexural Stresses</b> : Theory of simple bending – Assumptions and Limitations – Derivation of flexure formula, Bending stress distribution in beams of different cross sections – Moment of resistance - section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections</p>	6
<p><b>Unit 5. Shear Stresses</b></p> <p>Concept of shear, complimentary shear, derivation of shear stress formula, shear stress distribution for various cross sections like rectangular, circular, triangular, I, T angle sections., maximum and average shear stress for circular and rectangular sections.</p>	6



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<b>Unit 6. Principal Stresses and Strains</b> Concept of principal stresses, principal strains and principal planes; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress also with shear stress, normal and shear stresses on an oblique plane, Mohr's circle of stress, construction of Mohr's circle	6
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**Text Books:**

1	Punmia B. C., A. K. Jain and A. K. Jain, Mechanics of Materials - Laxmi Publications(P) Ltd, New Delhi, 2001.
2	Bhavikatti S.S., Structural Analysis -Vikas Publications House, New Delhi.

**Reference Books:**

1	S. B. Junnarkar and Dr. H. J. Shah, „Mechanics of Structures Vol. I &II“ - Charotar Publishing House Pvt. Ltd. - Twenty second edition
2	R.K.Bansal, „Strength of Materials“ - Laxmi Publications.
3	Timoshenko & Young, „Elements of Strength of Materials“ -Affiliated East West Press, New Delhi.
4	F.L. Singer and Andrew Pytel, „Strength of Materials“ - Harper and Row Publication.
5	Hibbeler, R. C., „Mechanics of Materials“ -Pearson Prentice Hall.
6	Beer and Johnston, „Mechanics of Materials“ - McGraw Hill Publication.
7	Gere J. M., „Mechanics of Materials“ - Thomson Books, New Delhi, 2003.
8	R.K Rajput, „ Strength of Materials“ - S. Chand & Company Ltd.



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**SEM-III (Academic Year-2023-24)**

**Course Plan**

<b>Course Title: Concrete Technology</b>	
<b>Course Code: 201CEL203</b>	<b>Semester: III</b>
<b>Teaching Scheme: L-T-P : 3-0-0</b>	<b>Credits: 3</b>
<b>Evaluation Scheme: ISE + MSE Marks : 20 + 30</b>	<b>ESE Marks: 50</b>

**Course Description:**

This course broadly encompasses the study of properties of ingredients of concrete, design of concrete mix, production of concrete and various concreting operations. Cementing material is the vital component of the concrete, hence study of process of manufacturing of cement, types of cement and their properties are covered in this course. Study of properties of aggregates and water also finds their due coverage in the course. Process of concrete production and concreting operations also forms an essential component of the course. In addition to the study of special purpose concretes, the course also provides the due coverage of admixtures which are added to modify the properties of concrete. Properties of concrete in plastic as well as in hardened stage find its due coverage in this course.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

1. To study materials used in concrete production and process of concrete manufacturing and to study properties of fresh concrete.
2. To study various mechanical properties and durability of hardened concrete.
3. To study mix design of concrete by using IS Code method and ACI method.
4. To study different Non Destructive Tests (NDT) and different types of special concretes.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C203.1	Explain physical properties of ingredients of concrete and their effect on strength and durability of concrete.
C203.2	Explain the fundamentals of process of making good quality concrete and the factors affecting properties of concrete.
C203.3	Solve the problems on concrete mix proportion as per Indian standard code of practice and ACI method.
C203.4	Explain Non Destructive Testing (NDT) of in-situ concrete and different types of special concretes.

<b>Prerequisite:</b>	Knowledge of General Science, Chemistry, Strength of materials.
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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C203.1	3	-	-	-	-	-	1	-	-	-	-	1	-	-	2
C203.2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	2
C203.3	-	3	-	-	-	-	1	1	-	-	-	-	1	1	3
C203.4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	2



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<b>Content</b>	<b>Hours</b>
<p><b>Unit 1. Ingredients of Concrete</b></p> <p><b>Cement:</b> Manufacturing process of cement, chemical composition, grades of cement, hydration, types of cement (Use of fly ash, blast furnace slag for manufacturing helping ecology), Tests for cement: fineness, standard consistency, setting time, soundness and compressive strength.</p> <p><b>Natural and Artificial Aggregates:</b> classification, requirements, Tests for Coarse Aggregates: Specific Gravity, Gradation, Flakiness Index, Elongation Index, Impact Value, Abrasion Value, Crushing Value.</p> <p>Tests for Fine Aggregates: Specific Gravity, Sieve Analysis, Fineness Modulus. Alkali Aggregate Reaction, bulking of sand, Manufactured sand (IS 838-2016)</p> <p><b>Water:</b> general requirements, quality of water.</p>	8
<p><b>Unit 2. Rheology of Concrete</b></p> <p><b>Properties of fresh concrete:</b> factors affecting workability, different tests for measurement of workability. Segregation, Bleeding.</p> <p>Manufacturing process of concrete: batching, mixing, transportation, compaction, curing of concrete, curing methods.</p>	4
<p><b>Unit 3. Hardened concrete</b></p> <p><b>Strength of concrete:</b> w/c ratio, gel/space ratio, gain of strength with age, maturity concept of concrete, effect of maximum size of aggregate on strength. Test on hardened concrete: compressive strength, comparison of compressive strength between cube test and cylinder test, split-cylinder test, flexural strength. Relation between compressive strength and tensile strength. Elastic constants, factors affecting modulus of elasticity, Creep – meaning and factors affecting it. Shrinkage – meaning, types – plastic, drying, carbonation and factors affecting shrinkage.</p> <p><b>Non Destructive Testing (NDT):</b> Schmidt's rebound hammer test, Ultrasonic pulse velocity test.</p>	6
<p><b>Unit 4. Concrete Mix Design</b></p> <p>Objectives of mix design, different methods of mix design, factors affecting mix proportions, quality control of concrete, statistical methods, acceptance criteria as per IS 456 - 2000, Numerical on Concrete mix design by ACI 211.1-1991, IS Code method using IS 10262-2019, Concrete Mix Design with Superplasticizer, Concrete Mix Design with Fly Ash.</p>	8



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<b>Unit 5. Admixtures in concrete</b> <b>Chemical Admixtures:</b> Plasticizers, Superplasticizers, Hyperplasticizers, Retarders, Accelerators, Air entraining agents, IS 9103 Specifications. <b>Mineral Admixtures:</b> Fly ash, Silica Fume, GGBFS, Rice husk ash, Metakaolin, Nano materials	4
<b>Unit 6. Special Concretes and Durability of concrete</b> <b>Special Concretes:</b> Light weight concrete, High density concrete, High Performance Concrete, Polymer modified concrete, concept of Fiber Reinforced Concrete, Self compacting concrete, Ready Mixed Concrete, Green Concrete, Recycled Concrete. <b>Durability of concrete:</b> Significance, Permeability and Durability relation, Chemical Attack, Sulphate attack, Attack by Seawater/ Chloride attack, Carbonation of concrete. RCPT test on concrete for durability, Carbonation Test.	6

**Text Books:**

1	Shetty M.S., Concrete Technology, S. Chand Publication.
2	Gambhir M.L., Concrete Technology, Tata McGraw Hill.

**Reference Books:**

1	A. M. Neville, J. J. Brooks, "Concrete Technology" Pearson Education India
2	A. M. Neville, "Properties of Concrete", Pearson Education India.
3	R.S. Varshney, "Concrete Technology", Oxford and IBH.
4	P. Kumar Mehta, "Microstructure and properties of concrete", Prentice Hall.SP-26.

**Codes:**

1	IS: 10262 - 2019, Concrete Mix Proportioning - Guidelines
2	IS 456 - 2000 Plain and Reinforced Concrete - Code of Practice
3	IS 383 – 2016 Coarse and Fine Aggregate for Concrete.
4	ACI 211.1 – 91 Concrete Mix Design





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**Course Plan**

<b>Course Title: Fluid Mechanics</b>	
<b>Course Code: 201CEL204</b>	<b>Semester: III</b>
<b>Teaching Scheme: L-T-P : 3-0-0</b>	<b>Credits: 3</b>
<b>Evaluation Scheme: ISE + MSE Marks : 20 + 30</b>	<b>ESE Marks: 50</b>

**Course Description:**

The material in this course will provide the student with a fundamental background in the statics and dynamics of fluids, laws of fluid mechanics and energy relationships. The basic conservation laws of mass, momentum and energy are analysed in control volume and differential form. The student will learn how to choose the right formulation for fluid flow problems. The student will also learn how to analyse practical fluid flow phenomenon and apply basic principles / concepts in fluid mechanics to solve real life situations.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

- 1 To study processes and science of fluid and their properties.
- 2 To study pressure measuring devices and pressure diagram.
- 3 To apply basic principles in fluid flow problems.
- 4 To identify the losses in pipes.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C204.1	Apply the basic properties of fluids and their behaviour to various force systems
C204.2	Apply the basic concepts and principles in fluid statics, fluid kinematics and fluid dynamics with their applications in fluid flow problems.
C204.3	Apply the principles of continuity, momentum and energy as applied to fluid in motion.
C204.4	Apply the equations to analyse problems by making proper assumptions and learn systematic engineering methods to solve practical fluid mechanics problems.

<b>Prerequisite:</b>	Engineering Physics, Fundamentals of Civil Engineering and Engineering Mechanics.
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**Course Articulation Matrix**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C204.1	3	2	-	-	1	-	-	-	-	-	-	-	-	-	3
C204.2	3	2	1	-	1	-	-	-	-	-	-	-	-	-	3
C204.3	3	2	1	-	-	-	-	-	-	-	-	1	1	-	3
C204.4	3	2	2	-	-	-	-	-	-	-	-	1	1	1	3



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<b>Course Content</b>	<b>Hours</b>
<b>Unit 1. Fluid Properties and Pressure Measurements</b> A) Physical Properties of fluid : Specific gravity, Viscosity, Surface tension, vapour pressure and their influence on fluid at rest and in motion B) Hydrostatics: Pascal's Law, Hydrostatic Law, Measurement of pressure: Barometer, Manometers, Mechanical gauges, Modern electronic devices	5
<b>Unit 2. Fluid Statics</b> A) Total pressure force and center of pressure on plane and curved surfaces (Numerical examples on Dams, Water tanks, Gates) B) Floatation and Buoyancy: Stability of Floating and submerged objects, Determination of Metacentric height of floating objects, Time of oscillation C) Relative equilibrium of fluid mass	7
<b>Unit 3. Fluid Kinematics and Similitude</b> A) Fluid Kinematics: Types of Flow, Continuity Equation, Flow net B) Dimensional Analysis and Model studies: Buckingham Pie Theorem, Non Dimensional numbers and their significance, Distorted river models based on Froude's model law	6
<b>Unit 4. Fluid Dynamics</b> A) Fluid Dynamics: Euler's and Bernoulli's equations along a streamline, Momentum equation applied to forces on pipe bends B) Measurement of flow: Pitot tube, Venturimeter, Orificemeter, Orifice and mouthpiece, Rotameter, modern equipments	6
<b>Unit 5. Boundary Layer Theory</b> A) Boundary Layer theory : Concept , B.L. along a thin plate, Separation of B.L. and its control, flow around submerged objects, Drag and Lift, Magnus effect B) Laminar and Turbulent Flow : Reynold's Experiment, Velocity Distribution, Hazen Poissulle's Equation, Power required to transmit the flow	5
<b>Unit 6. Losses in Pipe Flow</b> A) Flow through Pipes : Major and Minor losses, Darcy Weisbach Equation, Moody's diagram, Pipes in series, pipes in parallel, Two reservoir problems, Pipe network, introduction to related software B) Water hammer in pipes, Controlling Devices	7



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**Text Book:**

1	A.K. Jain -Fluid Mechanics — Khanna Pub., Delhi.
2	Modi/Seth – Hydraulic and Hydraulic Machines — Standard Book House, Delhi

**Reference Books:**

1	Streeter -Fluid Mechanics -McGraw-Hill International Book Co., Auckland.
2	V. T. Chaw - Flow in open channel –McGraw-Hill International Book Co., Auckland.
3	K. L. Kumar -Fluid Mechanics — Eurasia Publication House, Delhi.
4	Shames - Fluid Mechanics - McGraw-Hill International Book Co., Auckland.
5	Rangaraju -Open Channel flow– Tata McGraw-Hill Pub. Co., Delhi.
6	R.K. Bansal -Fluid Mechanics and hydraulic machine-, Laxmi Publication



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**Course Plan**

<b>Course Title: Building Construction and Drawing</b>	
<b>Course Code: 201CEL205</b>	<b>Semester: III</b>
<b>Teaching Scheme: L-T-P : 3-0-0</b>	<b>Credits: 3</b>
<b>Evaluation Scheme: ISE + MSE Marks : 20 + 30</b>	<b>ESE Marks: 50</b>

**Course Description:**

This course offers an introduction to the theory and construction of basic building systems and its requirements. It gives introduction of various building components with its functions and requirements. It also includes fundamental principles and concepts of planning and architecture for buildings.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

- 1 Prepare layout plans, drawings and details for construction of each and every part of the building
- 2 To understand the fundamental principles and concepts of planning and architecture for buildings
- 3 To plan Residential by making use of various aspects of principles of planning, architecture and as per standard bye laws.
- 4 To acquire knowledge about different types of foundations and masonry, flooring, roofing.
- 5 To obtain knowledge about design of various components of building like doors, windows, stairs lifts



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C205.1	Interpret and prepare different building drawings, technical terminologies related to building and various conventional signs and symbols used in drawing plans.
C205.2	Explore building drawing as a way of discovering and developing ideas for planning and designing residential buildings.
C205.3	Develop in- depth knowledge about construction of building components like foundations and masonry and its construction process .
C205.4	Apply knowledge of various building components to design and construction of buildings.

<b>Prerequisite:</b>	Fundamentals of Civil Engineering
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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C205.1	3	-	-	-	2	-	-	-	-	-	-	1	1	-	3
C205.2	3	-	2	-	1	1	2	3	-	-	-	1	2	1	4
C205.3	3	-	-	-	-	-	1	-	-	-	-	1	1	1	3
C205.4	3	-	-	-	-	-	1	-	-	-	-	1	1	1	3



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Course Content	Hours
<p><b>Unit 1. Building Drawings :</b></p> <p>Types of construction drawings : Architectural Drawings - measured drawing, submission / municipal drawing, working/ detailed drawings, Structural Drawings</p> <p>Development of drawings : Line plan, location plan, layout plan, floor plan, cross-sections, elevations, site plan, concept of foundation plan, service plans ( plumbing, electrical, furniture and roof drainage )</p>	6
<p><b>Unit 2. Planning of Residential Building :</b></p> <p>Site selection criteria, Principles of Planning, Sun diagram, wind diagram, Rules and building byelaws of sanctioning authority, Building permission and completion procedure</p> <p>Planning of Residential Building - Detach, Semi-detach, Row and Apartments – space requirements, norms for minimum dimensions of different units</p>	10
<p><b>Unit 3. Building Foundations and Masonry :</b></p> <p><b>Foundations</b> - Functions and requirements of a good foundation, Classification of foundations according to material used and depth</p> <p><b>Masonry Construction :</b></p> <p>Stone masonry : Technical terms, joints, Classification of Stone masonry.</p> <p>Brick masonry : Properties of bricks, Technical terms, bonds in brick work.</p> <p>Other Masonry : Composite masonry, Hollow blocks masonry, Partition Wall, Cavity walls, A.A.C. blocks</p> <p>Lintels &amp; Arches: Lintels – types, construction. Arches – technical terms, types, construction</p>	8
<p><b>Unit 4. Stairs, Lifts and Escalators :</b></p> <p>Technical terms in stairs, Requirements of good stair, Types of Stairs, Geometrical design of Dog legged stair, open well and quarter turn stairs. Concept of folded stair, Lifts, Ramps and Escalators –functions and requirements</p>	8
<p><b>Unit 5. Doors, Windows :</b></p> <p>Location of doors and windows, technical terms, Types of Doors, Types of Windows, Varieties of materials for doors and windows and their properties.</p>	6
<p><b>Unit 6. Roofs and Floors :</b></p> <p>Types of Roofs and Roofing materials, Flat roof (RCC), Types of pitched roofs, Types of steel trusses, modern roofing materials like pre-coated sheets, sandwich sheets, Truss less roof.</p> <p>Types of flooring, Factors affecting selection of flooring materials, various types of tiles used as flooring material.</p> <p>Scaffolding and Formwork: types, Modern techniques like Mivan Formwork, Slip Forms.</p>	7



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**Text Books :**

1	B.C Punmia., „Building Construction“, Laxmi Publications Ltd New Dehli. Dec 2006
2	S.P. Arora, S.P. Bindra, „A Text Book of Building Construction“ – Dhanpat Rai Publications
3	Shah, Kale, Patki, Building Drawing –Tata McGraw- Hill
4	Y. S. Sane, Building Design and Drawing – Allied Book Stall, Pune
5	Rangawala S.C., „ Building Construction “, Charter Publishing House, Anand, India,35th Edition 2008

**Reference Books :**

1	Time Saver Standard by Dodge F. W., F. W. Dodge Corp.
2	Mohan Rai and M.P. Jain Singh, „Advances in Building Materials and Construction“ publication by CBRI, Roorkee.
3	V.B. Sikka, A Course in Civil Engineering Drawing – S.K. Kataria and Sons
4	SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
5	I.S. 962 – 1989 Code for Practice for Architectural and Building
6	Dr. N.Kumara Swamy and A.Kameswara Rao,“Building Planning and Drawing”, 8th Edition, Charotar Publications, 2010.





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**Course Plan**

<b>Course Title : Mechanics of Structures Lab</b>	
<b>Course Code : 201CEP206</b>	<b>Semester : III</b>
<b>Teaching Scheme : L-T-P : 0-0-2</b>	<b>Credits : 1</b>
<b>Evaluation Scheme : ISE Marks : 25</b>	<b>ESE Marks: N.A.</b>

**Course Description:**

The experiment of Mechanics of Structures provides a broader practical approach with high equipped lab instruments and set-up. In this lab course, various experiments are conducted to explore and understand the properties of solid materials and its behaviours like tensile strength, compressive strength, hardness and impact value of different materials and stress values. These properties are understood by performing experiments on UTM, CTM, Izod and Impact Testing equipment, Hardness Testing equipment, etc. This lab course is of vital importance in analysis and design of Civil Engineering Structures. Also, it has large potential for R and D and Consultancy work.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

- 1 To perform experiments which are related to Mechanics of Structures subject to understand the practical related to theories of the subject.
- 2 To determine strength properties of different solid materials.
- 3 Understanding of professional and ethical responsibility in the areas of material testing.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C206.1	Conduct experiments to explore various properties of solid materials
C206.2	Compute and analyze engineering values (e.g. stress or strain) from laboratory measurements.
C206.3	Write a technical test report

**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C206.1	-	3	-	2	2	-	-	-	-	-	-	2	2	1	3
C206.2	-	3	-	2	-	-	-	1	-	-	-	2	2	1	4
C206.3	1	-	-	-	-	-	-	1	-	2	-	1	-	-	3



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**LIST OF EXPERIMENTS**

<b>Experiment No</b>	<b>Name of Experiment</b>	<b>Hours</b>
1	To determine the ultimate tensile strength of Mild steel and HYSD bars.	2
2	To determine the ultimate buckling strength of materials like mild steel, cast iron and copper, aluminium, and compare their strength.	4
3	Determination of compression test on Timber – along and parallel to the grains	2
4	Determination of compression test on Brick, AAC Bricks	2
5	Determination of shear strength of Mild steel- single and double shear	2
6	To determine Rockwell Hardness No. and Brinell Hardness No. of a sample	2
7	To estimate the Shock Resistance of different qualities of materials by Izod's test and Charpy test	2
8	Bending tests on simply supported beam on steel, Aluminium, Plywood, block board, timber and glass	4
9	Measurement of deflections in statically determinate beam	2
10	Demonstration of Strain gauges and Strain indicators	2

**Textbooks:**

1	Punmia B. C., A. K. Jain and A. K. Jain, Mechanics of Materials - Laxmi Publications (P) Ltd, New Delhi, 2001.
2	Bhavikatti S.S., Structural Analysis -Vikas Publications House, New Delhi.

**Reference Books:**

1	S. B. Junnarkar and Dr. H. J. Shah, „Mechanics of Structures Vol. I andII“ - Charotar Publishing House Pvt Ltd. - Twenty second edition
2	R.K.Bansal, „Strength of Materials“ - Laxmi Publications.
3	Timoshenko and Young, „Elements of Strength of Materials“ -Affiliated East West Press,New Delhi.
4	F.L. Singer and Andrew Pytel , „Strength of Materials“ - Harper and Row Publication.
5	Hibbeler, R. C., „Mechanics of Materials“ -Pearson Prentice Hall.



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**Course Plan**

<b>Course Title : Concrete Technology Lab</b>	
<b>Course Code : 201CEP207</b>	<b>Semester : III</b>
<b>Teaching Scheme : L-T-P : 0-0-2</b>	<b>Credits : 1</b>
<b>Evaluation Scheme : ISE Marks : 25</b>	<b>ESE Marks (OE): 25</b>

**Course Description:**

The course includes experiments related to physical properties of concrete ingredients, properties of fresh concrete, properties of hardened concrete and durability properties of concrete. It also includes experiments based on non-destructive testing of concrete.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

1. To study properties of concrete ingredients.
2. To understand properties of fresh concrete and mechanical properties of hardened concrete.
3. To know durability tests and non-destructive tests of concrete.

**Course Outcomes (COs):**

<b>COs</b>	<b>At the end of successful completion of course, the students will be able to...</b>
C207.1	Execute experiments on aggregate and cement to evaluate their different engineering properties.
C207.2	Execute experiments on concrete to evaluate the properties in fresh and hardened states.
C207.3	Demonstrate non-destructive tests on concrete.



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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C207.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3
C207.2	1	2	-	-	-	-	-	1	-	-	-	-	1	1	3
C207.3	3	-	-	-	1	-	-	-	-	-	-	-	-	-	3

**LIST OF EXPERIMENTS**

Experiment No	Name of Experiment	Hours
1	Sieve Analysis of Fine and Coarse Aggregates for Natural Sand and Manufactured Sand.	2
2	Determination of Specific Gravity, Water Absorption and Surface (Free) Moisture Content of Natural Aggregates and Manufactured Sand.	2
3	Flakiness Index and Elongation Index of Coarse Aggregate	2
4	Fineness of Cement and Standard Consistency of Cement	2
5	Initial and Final Setting Time of Cement, Soundness of Cement	2
6	Compressive Strength of Cement	2
7	Workability test by Slump Test	2
8	Workability test by Compacting Factor Test	2
9	Workability test by Flow Table Test	2
10	Workability test by Vee Bee Test	2
11	Concrete Mix Design with natural and manufactured sand.	2
12	Compressive Strength Test on Concrete	2
13	Non Destructive Tests on Concrete	2
14	Durability test on concrete by RCPT	2

- Minimum 12 experiments to be conducted



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**Text Books:**

1	Shetty M.S., „Concrete Technology – Theory and Practice“, S. Chand Publication.
2	Gambhir M.L., „Concrete Technology“, Tata McGraw Hill.

**Reference Books:**

1	A. M. Neville, J. J. Brooks, „Concrete Technology“ Pearson Education India
2	A. M. Neville, „Properties of Concrete“, Pearson Education India.
3	R.S. Varshney, „Concrete Technology“, Oxford and IBH.
4	P. Kumar Mehta, „Microstructure and properties of concrete“, Prentice Hall.SP-26.

**Codes:**

1	IS: 10262 - 2019, Concrete Mix Proportioning - Guidelines
2	IS 456 - 2000 Plain and Reinforced Concrete - Code of Practice
3	IS 383 – 2016 Coarse and Fine Aggregate for Concrete.



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**Course Plan**

<b>Course Title : Fluid Mechanics Lab</b>	
<b>Course Code : 201CEP208</b>	<b>Semester : III</b>
<b>Teaching Scheme : L-T-P : 0-0-2</b>	<b>Credits : 1</b>
<b>Evaluation Scheme : ISE Marks : 25</b>	<b>ESE Marks (POE): 25</b>

**Course Description:**

The course explores the principles of fluid mechanics through laboratory experiments and verifies various hydraulic phenomena on laboratory setups.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

- 1 To provide students hands-on practice for measurement of viscosity, pressure and discharge by using measuring devices.
- 2 To develop the skill required for applying knowledge to analysis of flow in pipe.
- 3 To develop the skill required for applying knowledge to estimate the losses in pipe flow.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C208.1	Measure fluid flow parameters and apply to behaviour of real fluid properties
C208.2	Develop the flow pattern and draw flow net
C208.3	Calculate the different losses in pipes to be used in pipe design type of flow ...

**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C208.1	1	1	-	-	1	-	-	-	-	-	-	1	-	-	3
C208.2	1	-	-	-	1	-	-	-	-	-	-	1	1	-	3
C208.3	1	-	1	1	-	-	-	-	-	-	-	2	1	1	3





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**LIST OF EXPERIMENTS**

<b>Experiment No</b>	<b>Name of Experiment</b>	<b>Hours</b>
1	Study of Pressure Measuring Devices: Piezometer , Manometer , barometer	2
2	Measurement of Discharge, Use of water meter, rotameter.	2
3	Determination of Metacentric Height for Floating Bodies.	2
4	Verification of Bernoulli's Theorem.	2
5	Calibration of Venturimeter and orificemeter	2
6	Plotting of flow net	2
7	Determination of Hydraulic Coefficients of Orifice and mouthpiece	2
8	Reynold's Experiment	2
9	Determination of Friction Factor for pipes of different material and diameter	2
10	Determination of Minor Losses in a Given Pipe	2
11	Study of different valves by visiting manufacturing industries and installation sites	2
12	Study of Moody's Chart , commercial pipe design nomograms	2

**Text Books:**

1	A.K. Jain -Fluid Mechanics — Khanna Pub., Delhi.
2	Modi/Seth – Hydraulic and Hydraulic Machines -- Standard Book House, Delhi

**Reference Books:**

1	Streeter -Fluid Mechanics -McGraw-Hill International Book Co., Auckland.
2	V. T. Chaw - Flow in open channel –McGraw-Hill International Book Co., Auckland.
3	K. L. Kumar -Fluid Mechanics — Eurasia Publication House, Delhi.
4	Shames - Fluid Mechanics - McGraw-Hill International Book Co., Auckland.
5	Rangaraju -Open Channel flow– Tata McGraw-Hill Pub. Co., Delhi.
6	R.K.Bansal -Fluid Mechanics and hydraulic machine-, LaxmiPubication



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**Course Plan**

<b>Course Title : Building Construction and Drawing Lab</b>	
<b>Course Code : 201CEP209</b>	<b>Semester : III</b>
<b>Teaching Scheme : L-T-P : 0-0-4</b>	<b>Credits : 2</b>
<b>Evaluation Scheme : ISE Marks : 50</b>	<b>ESE Marks: 25</b>

**Course Description:**

This course aims at preparation the sketches and detailed drawings of various building components. It also includes functional planning of residential buildings by application of principles of planning, building bye-laws, Planning regulations recommendations of NBC and design aspects for different. It focus on preparing drawings of Plan, elevation, sections and other details using CAD software

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

1. Prepare the sketches and drawing for various building components and understand the drawing principles involved in the design.
2. Analyze and apply the principles of planning, bye laws involved in planning and architectural concepts of residential buildings.
3. Know the procedures of submission of drawings and Develop working and submission drawings for building

**Course Outcomes (COs):**

<b>COs</b>	<b>At the end of successful completion of course, the students will be able to...</b>
C209.1	Prepare sketches and drawings of various building components.
C209.2	Plan residential building by applying various principles, bye-laws and codes of practices in planning and design.
C209.3	Develops basic drawing skills; create multilayer architectural and working drawing drawings using Auto CAD.



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**SEM-III (Academic Year-2023-24)**

**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C209.1	3	-	-	-	-	-	-	-	-	2	-	1	1	-	3
C209.2	3	2	-	1	1	-	1	3	-	2	-	1	2	1	6
C209.3	3	-	-	-	1	-	-	-	-	2	-	1	1	-	3

**LIST OF EXPERIMENTS**

Exp. No	Name of Experiment	Hours
<b>A</b>	<b>Draw with suitable scale on half Imperial Drawing Sheet :</b>	
1	Lettering, Symbols, Types of lines and dimensioning as per IS 962	2
2	Foundations: Isolated Footing, Combined Footing, Under Reamed Piles. (with reinforcement details)	2
3	Brick Masonry: Types of brick masonry Details of English & Flemish bond	2
4	Stone Masonry : Type of stone masonry	2
5	Stairs : Types of stairs, Design and drawing of Dog legged stair	2
6	Doors : Types of doors, Details of double shutter Paneled Door	2
7	Windows : Types of windows, Details of Casement window	2
8	Roofs: Types of of trusses, Details of king or queen post truss	2
<b>B</b>	<b>Drawing to a scale on Full Imperial Drawing Sheet using Auto CAD</b>	
1	Plan ( G+1 ) framed structure Residential Building & Draw submission drawing, to the scale 1:100, of showing	8
	Developed floor plans	4
	Elevation and Side elevations	4



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	Sections passing through W.C., Bath and Toilets Sections passing through staircase	4
	Block plans (scale 1:200) and area statements, Site Plan with scale 1:500	4
	Schedule of Doors, Windows and openings and pro-forma	4
2	Prepare detailed working drawings, to the scale 1:50, of Residential Building planned above showing	
	Developed floor plans	4
	Elevation and Side elevations	4
	Sections passing through W.C., Bath and Toilets Sections passing through staircase	4
	Schedule of Doors, Windows	4
	Prepare roof drainage plan	2
3	<b>Field Project Work</b> : Measured drawing of G+1 residential building and prepare municipal drawing for the same in a group of 6 students.	

**Text Books :**

1	B.C Punmia., „Building Construction“, Laxmi Publications Ltd New Dehli. Dec 2006
2	S.P. Arora, S.P. Bindra, „A Text Book of Building Construction“ – Dhanpat Rai Publications
3	Shah, Kale, Patki, Building Drawing –Tata McGraw- Hill
4	Y. S. Sane, Building Design and Drawing – Allied Book Stall, Pune
5	Rangawala S.C., „ Building Construction “, Charter Publishing House, Anand, India,35th Edition 2008

**Reference Books:**

1	Time Saver Standard by Dodge F. W., F. W. Dodge Corp.
2	V.B. Sikka, A Course in Civil Engineering Drawing – S.K. Kataria and Sons
3	SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
4	I.S. 962 – 1989 Code for Practice for Architectural and Building
5	Dr. N.Kumara Swamy and A.Kameswara Rao,“Building Planning and Drawing”, 8th Edition, Charotar Publications, 2010.



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**Course Plan**

<b>Course Title : Computer Aided Drawing</b>	
<b>Course Code : 201CEP210</b>	<b>Semester : III</b>
<b>Teaching Scheme : L-T-P : 0-0-2</b>	<b>Credits : 1</b>
<b>Evaluation Scheme : ISE Marks : 25</b>	<b>ESE Marks :N.A.</b>

**Course Description:**

Students will be developing drawings based on planning principles of all types of buildings on CAD platform. Submission and working drawings are to be developed for a project

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

1	To develop plans of Residential building
2	To develop working drawings for a Project
3	To develop Municipal drawing

**Course Outcomes (COs):**

<b>COs</b>	<b>At the end of successful completion of course, the students will be able to...</b>
C210.1	Utilize CAD platform to draw building components drawings
C210.2	Draw residential building staircase plan on CAD



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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C210.1	2	-	-	-	-	-	-	-	-	-	-	2	-	-	3
C210.2	2	1	2	-	-	-	-	-	-	2	-	2	1	1	3

**LIST OF EXPERIMENTS**

Experiment No	Name of Experiment	Hours
1	Study of Auto CAD	6
2	Draw plans for Residential Buildings	6
3	Draw Elevation and sections for Residential Building	6
4	Preparation of Municipal submission drawings for a Project of Residential Building.	6

**Text Books:**

1	Auto CAD Fundamentals ( by Autodesk )
2	Civil Engineering Drawing – M. Chakraborty

**Reference Books:**

1	Auto CAD – David Fray ( BPB Sybex Publication )
2	I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings



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**Course Plan**

<b>Course Title: Structural Analysis</b>	
<b>Course Code: 201CEL211</b>	<b>Semester: IV</b>
<b>Teaching Scheme: L-T-P : 3-1-0</b>	<b>Credits: 4</b>
<b>Evaluation Scheme: ISE + MSE Marks : 20 + 30</b>	<b>ESE Marks: 50</b>

**Course Description:**

Structural analysis is the determination of the effects of loads on physical structures and their components. This analysis includes the study of effects of loads on buildings, bridges, machinery, furniture, etc. Structural analysis requires fields of applied mechanics, materials science and applied mathematics to compute a structure's deformations, internal forces, stresses, support reactions and stability. The results of the analysis are used to verify a structure's fitness for use, often saving physical tests. Structural analysis is a key part of the engineering design of structures.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective civil engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

- 1 To provide concept and knowledge of structural analysis with significance of statically determinate and indeterminate structure.
- 2 To Understand the terminologies and concepts of displacements, stresses, strains, stiffness etc. and their parameters in the context of determinate systems.
- 3 To understand the concepts of strain energy and analysis of plane truss.
- 4 To understand the concepts of axially and eccentrically loaded columns
- 5 To learn the torsion and the corresponding stress distribution for circular shafts and cylinders.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C211.1	Apply various methods of analysis of plane trusses and arches
C211.2	Apply different procedures to calculate slope and deflections for determinate structures.
C211.3	Analyze columns and struts under axial and eccentric loading
C211.4	Analyze determinate beams, circular shaft and cylinders

<b>Prerequisite:</b>	Mechanics of structures
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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C211.1	3	2	-	1	-	-	-	-	-	-	-	1	1	1	3
C211.2	3	3	-	2	-	-	-	-	-	-	-	1	2	1	3
C211.3	3	3	-	1	-	-	-	-	-	-	-	1	1	1	4
C211.4	3	2	-	2	-	-	-	-	-	-	-	1	2	1	4





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<b>Course Content</b>	<b>Hours</b>
<p><b>Unit 1. Analysis of Statically Determinate Trusses and Arches</b></p> <p>a) Analysis of plane trusses : Concepts of redundancy, Analysis by method of joints, method of sections and graphical method</p> <p>b) Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches, Analysis of Three hinged arches - Normal Thrust and radial shear - Geometrical properties of parabolic and circular arches - Three-Hinged Structures with Support at Same and different Level, Analysis of Three-Hinged Arches by the Graphical Method</p>	8
<p><b>Unit 2. Displacement of Determinate Beams</b></p> <p>Differential equation of elastic curve, relation between moment, slope and deflection, Double integration method, Macaulay's method, Moment Area Method, Conjugate Beam Method applied to beams</p>	8
<p><b>Unit 3. Strain Energy</b></p> <p>a) <b>Strain Energy</b> – stresses and strains due to suddenly applied, gradual and impact loading. Strain energy due to direct stress, shear stress and bending stress</p> <p>b) <b>Energy Theorems :</b></p> <p>Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castiglano's theorem-Unit Load Method - Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames.</p>	8
<p><b>Unit 4. Axially and Eccentrically Loaded Columns</b></p> <p>Theory of Columns: Concept of short and long columns, concept of critical load and buckling, formulae by Euler and Rankine, Limitation of Euler's Formula, concept of equivalent length for various end conditions, eccentrically loaded short compression members. Rankine's constant for different materials –applications (simple and built up sections)</p>	8
<p><b>Unit 5. Direct and Bending Stresses</b></p> <p>Define eccentricity, Direct and bending stresses for eccentrically loaded solid and hollow sections of rectangular and circular columns. Kern of section - Pressure distribution of dams and retaining walls, chimneys, etc. Effect of lateral force and self-weight. Resultant stress diagrams due to axial loads, uni-axial, and bi-axial bending. Concept of core of section for solid and hollow rectangular and circular sections.</p>	8



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<p><b>Unit 6. Theory of Pure Torsion and Cylinders</b></p> <p><b>a) Torsion of Circular Shafts :</b> Theory of pure torsion – derivation of torsion formulae – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Concept of mean and maximum torque - Combined bending and torsion and end thrust</p> <p><b>b) Thin and Thick Cylinders :</b> Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders, Thick Cylinders : Lamé’s equation - stresses in thick cylinders due to internal and external pressures</p>	8
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**Tutorials**

Sr. No.	Title	Hours
1	Analysis of Statically Determinate Trusses and Arches	1
2	Analysis Trusses and Arches by the Graphical Method	1
3	Displacement of Determinate Beams : Calculation of slope and displacement by Double integration method, Macaulay’s method	1
4	Displacement of Determinate Beams : Calculation of slope and displacement by Moment Area Method, Conjugate Beam Method	1
5	Energy Theorems : Deflections of simple beams and pin- jointed plane frames	1
6	Theory of Axially and Eccentrically Loaded Columns	1
7	Direct and bending stresses for eccentrically loaded solid and hollow sections of rectangular and circular columns.	1
8	Direct and bending stresses : Pressure distribution of dams and retaining walls, chimneys, etc.	1
9	Theory of Pure Torsion	1
10	Theory of Thin and Thick Cylinders	1



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**Text Books**

1	Punmia B. C., A. K. Jain and A. K. Jain, Mechanics of Materials -Laxmi Publications(P) Ltd, New Delhi, 2001.
2	Bhavikatti S.S., Structural Analysis -Vikas Publications House, New Delhi.

**Reference Books**

1	S. B. Junnarkar and Dr. H. J. Shah, „Mechanics of Structures Vol. I andII“ - Charotar Publishing House Pvt Ltd. - Twenty second edition
2	R.K. Bansal, „Strength of Materials“ - Laxmi Publications.
3	Timoshenko and Young, „Elements of Strength of Materials“- Affiliated East West Press, New Delhi.
4	F.L. Singer and Andrew Pytel , „Strength of Materials“ - Harper and Row Publication.
5	Hibbeler, R. C., „Mechanics of Materials“ -Pearson Prentice Hall.
6	Beer and Johnston, „Mechanics of Materials“ - McGraw Hill Publication.
7	Gere J. M., „Mechanics of Materials“ - Thomson Books, New Delhi, 2003.
8	R.K. Rajput, „ Strength of Materials“ - S. Chand and Company Ltd.



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**Course Plan**

<b>Course Title: Geotechnical Engineering</b>	
<b>Course Code: 201CEL212</b>	<b>Semester: IV</b>
<b>Teaching Scheme: L-T-P : 3-0-0</b>	<b>Credits: 3</b>
<b>Evaluation Scheme: ISE + MSE Marks : 20 + 30</b>	<b>ESE Marks: 50</b>

**Course Description:**

This course is one of the basic sub branches of Civil Engineering. It deals with the behaviour of earth material as an engineering material. The knowledge of this course is applied to the design of foundations, retaining walls, earth dams, clay liners, and geosynthetics. This course also provides lot of scope for research, as earth material available with wide variety of conditions. This course uses the principles of soil mechanics and rock mechanics for the solution of its respective engineering problems. This course is a pre-requisite for the course foundation engineering.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective civil engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

- 1 To provide students necessary knowledge and skill required for soil classification and index properties determination.
- 2 To introduce students the concepts of permeability, soil compaction and consolidation with field control and application.
- 3 To impart the knowledge about stress conditions in soil and earth pressure on retaining structures for different soil states and its evaluation.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C212.1	Describe the concepts related to index and engineering properties of soil.
C212.2	Evaluate the index properties and engineering properties of soil, its relationship and explain its significance
C212.3	Determine stresses in soil and lateral earth pressure acting on retaining wall.

<b>Prerequisite:</b>	Fundamentals of Civil Engineering and Engineering Mechanics; Structural Analysis; Fluid Mechanics
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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C212.1	3	-	-	-	-	-	-	-	-	-	-	2	-	-	2
C212.2	3	3	-	2	-	-	-	-	-	-	-	2	2	-	3
C212.3	3	3	-	-	-	-	-	-	-	-	-	2	2	-	3



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<b>Course Content</b>	<b>Hours</b>
<b>Unit 1. Properties of Soil</b> Introduction to Soil Mechanics, Three phase soil system, Weight volume relationships, index properties of soil - $w$ , $e$ , $n$ , $a_c$ , $S_r$ , unit weight, density, relative density. functional relationships, problems on functional relationship, Formation of clay minerals, structure, Soil consistency and indices, I.S. classification of soil, plasticity chart	6
<b>Unit 2. Permeability and Seepage</b> Darcy's law, Factors affecting permeability, determination of permeability, Permeability of layered soils, General flow equation. Flow net and its application, Total, effective stress and pore pressure	6
<b>Unit 3. Compaction and Consolidation</b> <b>Compaction-</b> definition, Factors affecting compaction, SPT and MPT, field compaction equipment, Field compaction control, <b>consolidation-</b> Spring analogy, Terzaghi's theory of 1D consolidation, $C_c$ , $C_v$ , $m_v$ , $a_v$ explanation and pre-consolidation pressure, Square root of time and logarithmic time fitting method	6
<b>Unit 4. Shear Strength of Soil</b> <b>Mohr's circle</b> , Mohr-coulomb failure criteria, Effective stress concept. Factors affecting shear strength, Determination of shear strength (Direct Shear Test, Unconfined Compression test, Tri-axial shear test, Vane Shear Test)- numerical, Shear strength of different types of soil, Sensitivity and thixotropy, Expansive soil	6
<b>Unit 5. Stress Distribution in Soils &amp; Principles of Soil Dynamics</b> <b>Stress Distribution in Soil-</b> Boussinesq theory and Westergaard's theory- Pressure distribution, pressure bulb, approximate stress distribution method. contact pressure concept, rigid and flexible approach <b>Principles of Soil Dynamics-</b> Introduction to soil dynamics, Measurement of dynamic soil properties	7
<b>Unit 6. Lateral Earth Pressure Earth pressure-</b> Rankine's theory, Active and Passive earth pressure-dry, surcharge, water table case, Coulomb's theory	5



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**Text Books:**

1	B. C. Punmia, Ashok Kumar Jain, "Soil Mechanics and Foundation Engg", Laxmi Publications Pvt Limited, 16 <sup>th</sup> Edition
2	Braja M. Das, G. V. Ramana, "Principles of Soil Dynamics", Cengage Learning, 7 <sup>th</sup> Edition

**Reference Books:**

1	Karl Terzaghi, Mesri, Ralph B. Peck, R. B. Peck, "Soil mechanics in engineering practice", Wiley, 3 <sup>rd</sup> Edition
2	Joseph E. Bowles, "Foundation Analysis and Design", McGraw-Hill Education (India) Private Limited, 5 <sup>th</sup> Edition
3	V. N. S. Murthy, "Soil Mechanics and Foundation Engg." CBS Publishers and Distributors, 2 <sup>nd</sup> Edition
4	K.R.Arora, "Soil Mechanics and Foundation Engg.", Standard Publishers Distributors, 2 <sup>nd</sup> Edition
5	Braja M. Das, Nagaratnam Sivakugan, Siva Sivakugan " Introduction to Geotechnical Engineering", Cengage Learning, 6 <sup>th</sup> Edition
6	P. Purushottam Raj, "Geotechnical Engineering", Dorling Kindersley, 1 <sup>st</sup> Edition

**Web links:**

1	NPTEL website: <a href="https://nptel.ac.in/courses/105/107/105107066/">https://nptel.ac.in/courses/105/107/105107066/</a>
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**Course Plan**

<b>Course Title: Building Planning and Design</b>	
<b>Course Code: 201CEL213</b>	<b>Semester: IV</b>
<b>Teaching Scheme: L-T-P : 3-0-0</b>	<b>Credits: 3</b>
<b>Evaluation Scheme: ISE + MSE Marks : 20 + 30</b>	<b>ESE Marks: 50</b>

**Course Description:**

The course includes classification of buildings, provisions of National Building Codes and rules, building byelaws, open area, setbacks, FAR terminology. Also it includes design and drawing of residential and public buildings

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

- 1 To define and apply the principles and code of practices for planning and designing of various public buildings
- 2 To understand the concept of low cost housing and Green buildings.
- 3 To impart knowledge of different types of building services, repairs maintenance and treatments





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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C213.1	Plan and design of large-scale public buildings with high degree of complexity by applying various principles, bye laws and codes of practices.
C213.2	Create building aesthetics in planning and perspectives.
C213.3	Understand the concept of low cost housing and green buildings.
C213.4	Understand and apply knowledge of different types of building services

<b>Prerequisite:</b>	Building constructions and drawing
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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C213.1	3	-	2	-	-	1	1	2	-	-	-	1	2	1	4
C213.2	2	-	-	-	-	-	-	-	-	-	-	-	1	1	4
C213.3	1	-	-	-	-	1	1	-	-	-	-	-	1	1	2
C213.4	3	-	-	-	-	1	2	-	-	-	-	1	2	1	3



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<b>Course Content</b>	<b>Hours</b>
<p><b>Unit 1. Planning of Public Building :</b></p> <p>Site selection, site layout for various types of building such as : Educational buildings - (Younger age range, middle age range), Building for health –(health centers, hospitals), Assembly buildings – (recreational halls, cinema theatres, restaurants, hotels, clubs), Business and mercantile buildings –(shops, banks, markets and malls), Industrial buildings –(factories, workshops, cold storages), Office buildings- (administrative buildings, corporate office), Buildings for transportation- (Bus stations, Truck Terminal).</p>	12
<p><b>Unit 2. Sustainable Building Design :</b></p> <p>Concept of low cost housing, concept of Green Building, introduction to rainwater harvesting</p>	3
<p><b>Unit 3. Building Aesthetics :</b></p> <p>Principles of building aesthetics like Unity, Mass-Balance, Symmetry, Contrast, Proportion, Scale, Rhythm, and Accentuation. Character of building. Introduction to new techniques of façade like structural glazing and dry cladding.</p> <p><b>Perspective Drawings :</b></p> <p>Elements of perspective drawings, Parallel perspective and Angular perspectives of different objects and small buildings, Modern tools for 3d view</p>	6
<p><b>Unit 4. Building Services 1 :</b></p> <p><b>Water supply &amp; Drainage ( Plumbing) :</b> Systems, Various Materials for systems like A-PVC, C-PVC, GI, and HDPE, Various types of traps, Fittings, Chambers, Need of Septic Tank, Concept of Plumbing and Drainage plan</p> <p><b>Fire resistance in Building :</b> Fire protection precautions, confining of fire, fire hazards, building materials and their resistance to fire. Introduction to advanced firefighting system, concept of sprinklers, fire detectors, addressing system, refuge areas, etc.</p>	8
<p><b>Unit 5. Building Services 2 :</b></p> <p><b>Electrification:</b> Types - Concealed and Open Wiring, Requirements and Location of various points, Concept of Earthing, UPS &amp; generators</p> <p><b>Ventilation:</b> Definition and Purposes, Air conditioning: Purpose, classification and methods,</p> <p><b>Sound Insulation :</b> Materials and methods, noise control</p> <p><b>Acoustics :</b> Purpose and methods, Sabin’s formula, reverberation time</p>	8



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<b>Unit 6. Building Finishes :</b> <b>Plastering :</b> Purpose of plastering, Materials of plastering, Methods of plastering, Defects in plastering. Concept of form finish. <b>Pointing :</b> Purpose and types of pointing <b>Paints :</b> Introduction to Paintings, Defects , types of Paints and Varnishes. <b>Damp Proofing :</b> Causes, Effects and Methods of Damp Proofing.	8
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**Text Books:**

1	Shah, Kale, Patki, Building Drawing –Tata McGraw- Hill
2	Y. S. Sane, Building Design and Drawing – Allied Book Stall, Pune
3	B.C Punmia., „Building Construction“, Laxmi Publications Ltd New Dehli. Dec 2006
4	S.P. Arora, S.P. Bindra, „A Text Book of Building Construction“ – Dhanpat Rai Publications
5	Dr. N.Kumara Swamy and A.Kameswara Rao,“Building Planning and Drawing”, 8th Edition, Charotar Publications, 2010.

**Reference Books:**

1	Time Saver Standard by Dodge F. W., F. W. Dodge Corp.
2	SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
3	Dr. N. Kumara Swamy, A. Kameswara Rao ‘Building Planning And Drawing’ Charter Publishing House, Anand, India,
4	V.B. Sikka, A Course in Civil Engineering Drawing – S.K. Kataria and Sons
5	Sandeep Mantri, A to Z of Practical Building Construction and Its Management- Satya Prakashan, New Delhi



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**Course Plan**

<b>Course Title: Engineering Survey</b>	
<b>Course Code: 201CEL214</b>	<b>Semester: IV</b>
<b>Teaching Scheme: L-T-P : 3-0-0</b>	<b>Credits: 3</b>
<b>Evaluation Scheme: ISE + MSE Marks : 20 + 30</b>	<b>ESE Marks: 50</b>

**Course Description:**

The course includes introduction to various techniques of surveying which is an important field of Civil Engineering. The course aims to give thorough knowledge to students about the use of various traditional and modern instruments in surveying. Also this course includes both traditional and modern methods of surveying.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

- 1 To describe the functions of surveying in Civil Engineering field.
- 2 To study the traditional methods of surveying such as chain compass survey, simple and differential levelling, theodolite traversing, tachometry, and contouring
- 3 To study the modern techniques of surveying such as use of Total Station.
- 4 To study different methods of plane survey, geodetic survey, hydrographic survey.
- 5 To calculate, design and establish curves, understand, interpret and prepare plan, profile and cross-sectional drawing.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C214.1	Demonstrate basics of plane surveying and differentiate instrument used for it.
C214.2	Operate surveying equipment and analyse surveying data obtained from this equipment.
C214.3	Plan and execute different types of surveys like chain - compass survey, theodolite survey, contour survey, etc.
C214.4	Use modern instruments like Total Station in Civil Engineering projects.

<b>Prerequisite:</b>	Fundamentals of Civil Engineering, Geometry, Trigonometry
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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C214.1	2	-	-	-	1	1	-	-	-	-	-	-	-	-	3
C214.2	2	-	-	-	1	1	-	-	-	-	-	-	-	-	3
C214.3	2	-	-	-	1	1	-	-	-	-	-	-	-	-	3
C214.4	2	-	-	-	1	1	-	-	-	-	-	-	-	1	3



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<b>Course Content</b>	<b>Hours</b>
<b>Unit 1. Introduction</b> a) Compass Surveying: Construction and use of prismatic compass, concept of WCB and QB and their conversion, local attraction, and correction for local attraction. b) Introduction to Plane Table Surveying, accessories used, methods of Plane Table Surveying (Radiation and intersection only)	6
<b>Unit 2. Levelling and Contouring</b> Introduction to levelling, Types of levelling, Types of benchmarks, Study and use of dumpy level, auto level, digital level and laser level in construction industry, principle axes of dumpy level, testing and permanent adjustments, reciprocal levelling, curvature and refraction corrections, distance to the visible horizon. Contouring—direct and indirect methods of contouring, uses of contour maps, study and use of topo-sheets, profile leveling and cross-sectioning and their applications.	8
<b>Unit 3. Theodolite Surveying</b> Uses of theodolite for measurement of horizontal angles by repetition and reiteration, vertical angles, measurement of deflection angles using transit theodolite and magnetic bearing, prolonging a line, lining in and setting out an angle with a theodolite. Fundamental axes of Theodolite: testing and permanent adjustments of a transit theodolite.	7
<b>Unit 4. Theodolite Traversing</b> Computation of consecutive and independent co-ordinates, adjustment of closed traverse by transit rule and Bowditch's rule, Gales traverse table. Checks, omitted measurements, area calculation by independent co-ordinates. <b>Planimeter</b> -Introduction to digital planimeter.	6
<b>Unit 5. Curves</b> <b>Horizontal Curves</b> - Simple and Compound curves, elements of simple circular curves, linear and angular methods of setting out circular curves <b>Transition Curves</b> - types, characteristics and uses, Superelevation, Centrifugal ratio, Lemniscate curves <b>Vertical Curves</b> - Necessity and types, finding length of vertical curves	8



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<b>Unit 6. Introduction to GIS and Total Station</b> <b>GIS:</b> Definition of GIS, History and development of GIS, Components of GIS, Hardware and software, introduction to GPS <b>Surveying using Total Station</b> – Study and use of Electronic Tacheometer (Total Station) types, functions (remote elevation measurements, remote distance measurements, area measurement).	7
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**Text Books:**

1	N. N. Basak, „Surveying and Leveling“ - Tata McGraw Hill.
3	Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain „Surveying, Vol. I and II“ - Laxmi Publications

**Reference Books:**

1	T. P. Kanetkar and S.V. Kulkarni, „Surveying and Leveling“ Vol. I and Vol. II - Pune Vidyarthi Griha Prakashan.
2	S. K. Duggal, „Surveying, Vol. I and II“ - Tata Mc-Graw Hill.
3	Dr. K. R. Arora, „Surveying Vol. I and II“ - Standard Book House.
4	Subramanian, „Surveying and Levelling“ - Oxford University Press.
5	James M. Anderson, Edward M. Mikhail, „Surveying: Theory and Practice“ - Tata Mc-Graw Hill.
6	C. Venkatramaiah, „Textbook of Surveying“ - University Press.
7	John Uren and Bill Price, „Surveying for Engineers“ Palgrave Macmillan



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**SEM-IV (Academic Year-2023-24)**

**Course Plan**

<b>Course Title: Open Channel Hydraulics and Hydraulic Machines</b>	
<b>Course Code: 201CEL215</b>	<b>Semester: IV</b>
<b>Teaching Scheme: L-T-P : 3-0-0</b>	<b>Credits: 3</b>
<b>Evaluation Scheme: ISE + MSE Marks : 20 + 30</b>	<b>ESE Marks: 50</b>

**Course Description:**

The material in this course will provide the student with a fundamental background in the open channel flow, basic principles in fluid flows. The student will learn how to choose the right formulation for fluid flow problems and mechanism of pumps and turbines. The student will also learn how to analyse practical fluid flow phenomenon and apply basic principles / concepts in fluid mechanics to solve real life situations.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfill the needs of society.

**Course Objectives:**

- 1 To study uniform and non-uniform flow in open channel.
- 2 To apply basic principles in fluid flow problems in open channel.
- 3 To study velocity and discharge measurement devices.
- 4 To study impact of jet, Pumps and turbines.





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**Course Outcomes (COs):**

<b>COs</b>	<b>At the end of successful completion of course, the students will be able to...</b>
C215.1	Provide students with basic knowledge of types of open channel flows and flow parameters to analyze the flow.
C215.2	Apply the energy and momentum equations for GVF, RVF and SVF to flow of water in artificial and natural channels
C215.3	Apply the flow measurement techniques and modern methods of velocity, discharge , sediment transport of open channel flow
C215.4	Apply the performance characteristic curves and commercial manuals to choose the suitable efficient Hydraulic Machines

<b>Prerequisite:</b>	Fluid Mechanics - I
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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

<b>POs/ COs</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>PSO 1</b>	<b>PSO 2</b>	<b>BTL</b>
C215.1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	2
C215.2	3	3	2	-	-	-	-	-	-	-	-	1	-	-	3
C215.3	2	2	1	-	2	1	-	-	-	-	-	1	-	1	3
C215.4	2	1	1	-	2	1	-	-	-	-	-	1	1	1	3



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<b>Course Content</b>	<b>Hours</b>
<p><b>Unit 1. Uniform Flow in Open Channel</b></p> <p>A) Types of Flows in Open Channel, Geometric Elements, Velocity Distribution, Measurement of Velocity- (Pitot tube, Current Meter, modern electronic equipment , Sonar method , Acoustic doppler method )</p> <p>B) Steady and Uniform Flow : Chezy's and Manning's Formula, Selection of Chezy's and Manning's coefficients ,Uniform Flow Computations, Hydraulically Efficient Section (Rectangular, Triangular, Trapezoidal) , Basic principles of Irrigation canal Design</p>	7
<p><b>Unit 2. Gradually Varied Flow (GVF)</b></p> <p>A) Depth Energy Relationship in Open Channel Flow: Specific Energy , critical flow computations , Flow in transitions</p> <p>B) Steady Gradually Varied Flow (GVF) : Dynamic Equation of GVF, Classification of GVF Profiles- Practical Examples, Direct Step Method of Computation of GVF Profiles (use of MS Excel)</p>	7
<p><b>Unit 3. Rapidly Varied Flow (RVF)</b></p> <p>A) Rapidly Varied Flow (RVF): Definition, Hydraulic Jump- Phenomenon, Conjugate Depth Relationship, Characteristics, uses, types, location and application ,Hydraulic Jump as an Energy Dissipater, Unsteady RVF: Surges in open channel- Positive and Negative Surge.</p> <p>B) Spatially Varied Flow: Introduction, Basic Principles and Assumptions.</p>	7
<p><b>Unit 4. Notches and Weirs</b></p> <p>Types, Derivation of Discharge Equation, Velocity of Approach, Francis Formula, Errors in Measurement of Discharge Sharp, Broad and Round Crested Weirs, Time of Emptying Tank with Weir.</p> <p>Introduction to Ogee spillway and energy dissipator</p>	5
<p><b>Unit 5. Impact of Jet</b></p> <p>Impulse Momentum Principle, Impact of Jet on Vanes- Flat, Curved (Stationary and Moving), Inlet and Outlet Velocity Triangles, Series of Flat, Curved Vanes Mounted on Wheel.</p>	5



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<b>Unit 6. Pumps and Turbines</b> <b>A) Hydraulic Turbines:</b> Introduction to Hydro-Power plants (Micro Hydal plants), working of Pelton, Francis and Kaplan Turbine, Specific Speed, Selection of Type of Turbine, Small scale Modern Turbines <b>B) Centrifugal Pump:</b> Working of Centrifugal Pump, Jet pump , submersible pump, turbine pump , Rotary pump ,Common Pump Troubles and Remedies, Net Positive Suction Head (NPSH). , Selection of commercial pumps	7
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**Text Books:**

1	A.K. Jain -Fluid Mechanics — Khanna Pub., Delhi.
2	Modi/Seth – Hydraulic and Hydraulic Machines -- Standard Book House, Delhi

**Reference Books:**

1	Streeter -Fluid Mechanics -McGraw-Hill International Book Co., Auckland.
2	V. T. Chaw - Flow in open channel –McGraw-Hill International Book Co., Auckland.
3	K. L. Kumar -Fluid Mechanics — Eurasia Publication House, Delhi.
4	Shames - Fluid Mechanics - McGraw-Hill International Book Co., Auckland.
5	Rangaraju -Open Channel flow– Tata McGraw-Hill Pub. Co., Delhi.
6	R.K. Bansal -Fluid Mechanics and hydraulic machine-, Laxmi Pubication



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**SEM-IV (Academic Year-2023-24)**

**Course Plan**

<b>Course Title : Geotechnical Engineering Lab</b>	
<b>Course Code : 201CEP216</b>	<b>Semester : IV</b>
<b>Teaching Scheme : L-T-P : 0-0-2</b>	<b>Credits : 1</b>
<b>Evaluation Scheme : ISE Marks : 25</b>	<b>ESE Marks (POE): 25</b>

**Course Description:**

The course explores the principles Geotechnical Engineering through the laboratory experiments on soil. This lab course for PCC geotechnical engineering. In this course student need to identify index and engineering properties of soil. The interpretation of soil results is one of the important aspect of this lab course. This lab course has wide scope in the real life engineering work. The testing of engineering material (earth material) directly deals with the economical aspect of any civil engineering project. This lab course also has potential for research and development.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective civil engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

1	To evaluate index properties of soil and do soil classification
2	To determine engineering properties of soil

**Course Outcomes (COs):**

<b>COs</b>	<b>At the end of successful completion of course, the students will be able to...</b>
C216.1	Carryout experiments on different types of soil to evaluate index and engineering properties of soil
C216.2	Interpret results of soil testing and its behaviour.



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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C216.1	-	2	-	-	3	-	-	-	-	-	-	2	-	-	3
C216.2	-	2	-	3	-	-	-	-	-	-	-	2	2	2	4

**LIST OF EXPERIMENTS**

Experiment No	Name of Experiment	Hours
1	To Determine the water content of the given sample	2
2	Determination of the specific gravity of the given soil	2
3	Grain size distribution of soil by the Mechanical Sieve Analysis.	2
4	Determination of the Atterberg Limits of the Soil Sample: Liquid Limit, Plastic Limits and shrinkage limit( at least two)	2
5	Determination of the field density by Core Cutter / Sand Replacement Method	2
6	To Determine Coefficient of Permeability of The Given Soil Sample By Permeability Test	2
7	To Determination of the Optimum Moisture Content and maximum dry density by Proctor Test	2
8	To determine the shear strength of the soil by the Direct Shear Test	2
9	Introduction to laboratory data and statistical analysis.- (mean, SD, validation, calibration)	4
10	Demonstration (Any 2) <ul style="list-style-type: none"><li>• Unconfined Compression Test</li><li>• Triaxial shear test.</li><li>• Vane shear test</li><li>• One dimensional consolidation test.</li></ul>	4



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**Text Books:**

1	B. C. Punmia, Ashok Kumar Jain, “Soil Mechanics and Foundation Engg”, Laxmi Publications Pvt Limited, 16 <sup>th</sup> Edition
2	Braja M. Das, G. V. Ramana, “Principles of Soil Dynamics”, Cengage Learning, 7th Edition

**Reference Books:**

1	Karl Terzaghi, Mesri, Ralph B. Peck, R. B. Peck, “Soil mechanics in engineering practice”, Wiley, 3 <sup>rd</sup> Edition
2	Joseph E. Bowles, “Foundation Analysis and Design”, McGraw-Hill Education (India) Private Limited, 5 <sup>th</sup> Edition
3	V. N. S. Murthy, “Soil Mechanics and Foundation Engg.” CBS Publishers and Distributors, 2 <sup>nd</sup> Edition
4	K.R.Arora, “Soil Mechanics and Foundation Engg.”, Standard Publishers Distributors, 2 <sup>nd</sup> Edition
5	Braja M. Das, Nagaratnam Sivakugan, Siva Sivakugan “ Introduction to Geotechnical Engineering”, Cengage Learning, 6 <sup>th</sup> Edition
6	P. Purushottam Raj, “Geotechnical Engineering”, Dorling Kindersley, 1 <sup>st</sup> Edition
7	Alfred Bartolucci, Karan P. Singh, Sejong Bae, “Introduction to Statistical Analysis of Laboratory Data” Wiley, 2 <sup>nd</sup> Edition



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**Course Plan**

<b>Course Title : Building Planning and Design Lab</b>	
<b>Course Code : 201CEP217</b>	<b>Semester : IV</b>
<b>Teaching Scheme : L-T-P : 0-0-2</b>	<b>Credits : 1</b>
<b>Evaluation Scheme : ISE Marks : 25</b>	<b>ESE Marks (OE): 25</b>

**Course Description:**

The course includes functionally planning of public buildings with all comfort, services and regulatory aspects.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfil the needs of society.

**Course Objectives:**

- 1 Developing ideas for designing commercial and public buildings.
- 2 To draw Perspective drawing for a building.
- 3 Achieve skill sets to prepare computer aided engineering drawings
- 4 Understand the details of construction of different building services.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C217.1	Gain a broad understanding of planning and designing of public buildings as per the given requirements
C217.2	Draw perspective drawing for a Residential building
C217.3	Prepare, read and interpret the drawings for building services in a professional set up.

**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C217.1	2	1	2	-	-	1	1	1	-	1	-	1	1	2	4
C217.2	2	-	2	-	1	-	-	-	-	1	-	1	1	2	4
C217.3	2	-	1	-	-	1	1	-	-	1	-	1	1	1	3

**LIST OF EXPERIMENTS**

Exp. No	Name of Experiment	Hours
<b>A</b>	<b>Draw to a suitable scale on Full Imperial Drawing Sheet</b>	
1	Human Body figures and its application in space design	2
2	Draw line plan for Any two type of Public Buildings	2
3	Two Point Perspective drawings for object like steps	2
4	Two Point Perspective drawings for object like pillar	2





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<b>B</b>	<b>Drawing to a scale on Full Imperial Drawing Sheet using Auto CAD</b>	
5	Plan any one type of public building	6
	Prepare detailed working drawing as follows	
6	Developed floor plans	2
7	Elevation	2
8	Section passing through W.C., Bath and Toilets Section passing through staircase	2
9	Schedule of Doors, Windows	2
10	Design and prepare water supply and drainage layouts for building planned above	2
11	Design and prepare electrical layout drawing for building planned above	2
13	Design and prepare typical furniture layout drawing for building planned above	2
14	Development of 3D view for building planned above (optional)	4
	Note : One compulsory field visit/exercise to be carried out	

**Text Book:**

1	Shah, Kale, Patki, Building Drawing –Tata McGraw- Hill
2	Y. S. Sane, Building Design and Drawing – Allied Book Stall, Pune
3	Jain A.K., The Idea of Green Building Khanna Publishers, N. Dehli,
4	V.B. Sikka, A Course in Civil Engineering Drawing – S.K. Kataria and Sons
5	N.Kumara Swamy and A.Kameswara Rao, “Building Planning and Drawing”, 8th Edition, Charotar Publications, 2010.

**Reference Books:**

1	Time Saver Standard by Dodge F. W., F. W. Dodge Corp.
2	V.B. Sikka, A Course in Civil Engineering Drawing – S.K. Kataria and Sons
3	SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
4	I.S. 962 – 1989 Code for Practice for Architectural and Building
5	Dr. N.Kumara Swamy and A.Kameswara Rao, “Building Planning and Drawing”, 8th Edition, Charotar Publications, 2010.



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**SEM-IV (Academic Year-2023-24)**

**Course Plan**

<b>Course Title : Engineering Surveying lab</b>	
<b>Course Code : 201CEP218</b>	<b>Semester : IV</b>
<b>Teaching Scheme : L-T-P : 0-0-2</b>	<b>Credits : 1</b>
<b>Evaluation Scheme : ISE Marks : 25</b>	<b>ESE Marks (POE): 25</b>

**Course Description:**

The course includes introduction to various techniques of surveying which is an important field of civil engineering. The course aims to give thorough knowledge to students about the use of various traditional and modern instruments in surveying. Also, both traditional and modern methods of surveying are given due weightage in course curriculum.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective civil engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to full-fill the needs of society.

**Course Objectives:**

- 1 Describe the functions of surveying in civil engineering field.
- 2 Apply the traditional methods of surveying such as chain compass survey, simple and differential leveling, theodolite traversing, tachometry and contouring
- 3 Apply the modern techniques of surveying such as use of Total station.
- 4 Understand and apply different methods of plane survey, geodetic survey, hydrographic survey.
- 5 Calculate design and establish curves, understand, interpret and prepare plan, profile and cross-sectional drawing.
- 6 Work as team member on surveying party to achieve common goal of accurate and timely project completion



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C218.1	Demonstrate basics of plane surveying and different instrument used for it.
C218.2	Express proficiency in handling surveying equipment's and analyse surveying data obtained from these equipment's
C218.3	Use modern instruments like Total station in civil engineering projects

**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C218.1	2	-	-	-	1	1	-	-	1	1	-	-	-	-	3
C218.2	2	-	-	-	1	1	-	-	1	1	-	-	-	-	3
C218.3	2	-	-	-	1	1	-	-	1	1	-	-	1	1	3



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**a) LIST OF EXPERIMENTS**

<b>Experiment No</b>	<b>Name of Experiment</b>	<b>Hours</b>
1	Measurement of magnetic bearing by Prismatic Compass.	2
2	Plane table survey, method of radiation	2
3	Simple and differential levelling with at least two change points by using Auto level.	2
4	Measurement of horizontal angle by Direct method using vernier transit theodolite.	2
5	Measurement of horizontal angle by Repetition method	2
6	Setting out simple circular curve by offset from long chord.	2
7	Setting out simple circular curve by Rankines method of Deflection Angles	2
8	Introduction to GIS software: QGIS, Arc GIS	2
9	Use of GPS for property measurement.	2
10	Practical based on various special functions available in total station such as remote elevation measurements, remote distance measurements and co-ordinate stake out.	2
11	Setting out a building by given foundation plan (minimum six coordinates) using total station.	2

**b) PROJECTS**

- 1) Block contouring using Auto Level.
- 2) Road project using Auto level for minimum length of 1000 m. (Including fixing of alignment, profile levelling, cross-section, plotting of longitudinal section and cross-section).
- 3) Total Station Traversing.



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**Text Books:**

1	N.N. Basak, Surveying and Levelling, Tata McGraw Hill.
2	Dr. B. C. Punmia, Ashok K. Jain, Arun K.Jain, Surveying, Vol. I andII, Laxmi Publications

**Reference Books:**

1	T. P. Kanetkar and S.V. Kulkarni „Surveying and Leveling“ Vol. I and Vol. II - Pune Vidyarthi Griha Prakashan.
2	S. K. Duggal „Surveying, Vol. I and II“ - Tata Mc-Graw Hill.
3	Dr. K. R. Arora, „Surveying Vol. I and II“ - Standard Book House.
4	Subramanian, „Surveying and Levelling“ - Oxford University Press.
5	James M. Anderson, Edward M. Mikhail, „Surveying: Theory and Practice“ - Tata Mc-Graw Hill.
6	C. Venkatramaiah, „Textbook of Surveying“ - University Press.
7	John Uren and Bill Price, „Surveying for Engineers“ Palgrave Macmillan



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**Course Plan**

<b>Course Title : Open Channel Hydraulics and Hydraulic Machines Lab</b>	
<b>Course Code : 201CEP219</b>	<b>Semester : IV</b>
<b>Teaching Scheme : L-T-P : 0-0-2</b>	<b>Credits : 1</b>
<b>Evaluation Scheme : ISE Marks : 25</b>	<b>ESE Marks : N.A.</b>

**Course Description:**

The course explores the principles of fluid mechanics through open channel laboratory experiments and verifies various hydraulic phenomena on laboratory setups.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective civil engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfill the needs of society.

**Course Objectives:**

- 1 Explore the fundamental principles of mechanics through experimentation.
- 2 Demonstrate and analyze key hydraulic phenomena using hands-on physical devices.
- 3 To provide students knowledge about the working of centrifugal pump and Pelton wheel turbine.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C219.1	Apply the calibration process to notch and weir models and compare with prototype structures of weirs
C219.2	Apply the profiles of GVF and RVF to Open channel flow
C219.3	Analyze the performance and working of centrifugal pump and Pelton wheel turbine.

**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C219.1	1	2	-	-	-	1	-	-	-	1	-	1	1	-	3
C219.2	1	2	-	-	-	1	-	-	-	1	-	1	-	-	3
C219.3	1	2	-	--	-	1	-	-	-	1	-	2	2	1	4





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**LIST OF EXPERIMENTS**

<b>Experiment No</b>	<b>Name of Experiment</b>	<b>Hours</b>
1	Demonstration of Pitot Tube , Current meter	2
2	Calibration of V-Notch / Rectangular Notch.	2
3	Plotting of a GVF profile	2
4	Hydraulic characteristics of Hydraulic Jump.	2
5	Calibration of Ogee weir and plotting of Ogee profile	2
6	Calibration of Broad crested weir	2
7	Impact of Jet.	2
8	Demonstration of performance of Pelton Turbines	2
9	Performance test on Centrifugal Pump.	2
10	Visit report of Hydropower Plant, Pump House	2
11	Visit to River gauging station, K. T. weir	2
12	Study of modern commercial pump	2

**Text Books:**

1	A.K. Jain -Fluid Mechanics — Khanna Pub., Delhi.
2	Modi/Seth – Hydraulic and Hydraulic Machines -- Standard Book House, Delhi

**Reference Books:**

1	Streeter -Fluid Mechanics -McGraw-Hill International Book Co., Auckland.
2	V. T. Chaw - Flow in open channel –McGraw-Hill International Book Co., Auckland.
3	K. L. Kumar -Fluid Mechanics — Eurasia Publication House, Delhi.
4	Shames - Fluid Mechanics - McGraw-Hill International Book Co., Auckland.
5	Rangaraju - Open Channel flow– Tata McGraw-Hill Pub. Co., Delhi.
6	R.K. Bansal- Fluid Mechanics and hydraulic machine-, Laxmi Publication



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**Course Plan**

<b>Course Title: Environmental Studies</b>	
<b>Course Code: 201CEMC220</b>	<b>Semester: IV</b>
<b>Teaching Scheme: L-T-P : 2-0-0</b>	<b>Credits: 0</b>
<b>Evaluation Scheme: ISE + MSE Marks : - N.A.</b>	<b>ESE Marks: 50</b>

**Course Description:**

Environmental Studies course enhance a student's knowledge in a variety of currently relevant topics related to environmental awareness and pollution. The course aims to identify environmental problems, come-up with suitable solutions and create awareness for a hygienic and eco-friendly environmental.

**Program Specific Outcomes (PSOs):**

<b>PSO1</b>	To design and execute cost effective Civil Engineering solutions for sustainable development.
<b>PSO2</b>	To develop entrepreneur skills among the graduates to fulfill the needs of society.

**Course Objectives:**

- 1 Recognize the structure and functions of ecosystems with their importance.
- 2 Understand the environmental and social problems with global concern.
- 3 Understand the importance of environmental management for its protection.
- 4 Acquire problem solving skills through visits to different locations, identifying the environmental problems, proposing the solution models and exhibiting to the society and government authorities.



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**Course Outcomes (COs):**

COs	At the end of successful completion of course, the students will be able to...
C220.1	Understand the importance of ecosystem and biodiversity in view of its conservation.
C220.2	Understand the concept of hazardous waste and to promote healthier environment.
C220.3	Explain the importance of environmental management through pollution control boards.
C220.4	Propose solutions for problems related with environmental well beings through location visits and model exhibitions.

<b>Prerequisite:</b>	Understanding of Environmental Education course.
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**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C220.1	-	-	-	-	-	1	3	2	-	-	-	-	-	-	2
C220.2	-	-	-	-	-	1	2	-	-	-	-	-	-	-	2
C220.3	-	-	-	-	-	1	3	-	1	1	-	-	-	-	2
C220.4	-	-	-	-	-	2	3	1	1	1	-	-	-	-	3



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<b>Course Content</b>	<b>Hours</b>
<p><b>Unit 1. Ecology and Biodiversity</b></p> <p>Definition, types, importance and examples of ecology, types of community relationships: Symbiosis, predation and competition. Ecosystem: structure and functions, biotic and abiotic components, energy flows, ecological succession, food chain, food web &amp; ecological pyramid, types of ecosystems, degradation of ecosystems and its impact.</p> <p>Biodiversity hotspots: Western ghats, eastern Himalayas, threats to biodiversity and conservation of biodiversity, environmental ethics.</p>	8
<p><b>Unit 2. Environment and Health</b></p> <p>Air Pollution, water pollution. E-waste, waste minimization technology, Plastic waste, Population growth of the world and reduced health content of the environment, energy crisis, biofuels, Occupational health hazards, Concept of Carbon footprint.</p>	7
<p><b>Unit 3. Environmental Management</b></p> <p>Role of Central Pollution Control Board (CPCB) and Maharashtra Pollution Control Board (MPCB) in environmental protection of India. Concept of sustainability, ISO Certification.</p>	5
<p><b>Unit 4. Field Work</b></p> <p>Visit to a local area for documentation of environmental assets- River/forest/grassland/hill/mountain OR Visit to a local polluted site-Urban/Rural/Industrial/Agricultural OR Study of common plants, insects, birds OR Study of simple ecosystems- Ponds, Lakes, Rivers, Hill slopes, etc.</p>	5



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**Text Books:**

1	Trivedi R.K. and P.K Goel, Introduction to Air Pollution, Tech-science Publications.
2	Mhaskar A.K, Matter Hazardous, Techno-Science Publication.

**Reference Books:**

1	Bharucha, Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India
2	Hawkins R.E., Encyclopaedia of Indian Natural History, Bombay Natural History Society, Bombay
3	Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I &II, Environmental Media.
4	Miller T.G. Jr., Environmental Science, Wadsworth Publications Co.
5	Sharma B.K., Environmental Chemistry, Gokel Publ. House, Meerut.