

# UNIVERSITY OF JAMMU

(NAAC ACCREDITED A + GRADE UNIVERSITY)  
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

## NOTIFICATION

(23/Sept/Adp/80)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Competent Bodies, has been pleased to authorize the adoption of the revised Syllabi and Courses of Studies in **Bachelor of Technology (B.Tech.) in Civil Engineering** for Semester III & IV under the **Credit Based System** as per the new AICTE Model Curriculum (as given in the Annexure) for the candidates of **Govt./Pvt. Engineering Colleges affiliated with the University of Jammu** for the Examinations to be held in the years indicated against each Semester as under:-

Branch	Semester	For the Examination to be held in the years
Civil	Semester-III	December 2023, 2024, 2025 and 2026
	Semester-IV	May 2024, 2025, 2026 and 2027

The Syllabi of the course are available on the University Website: [www.jammuuniversity.ac.in](http://www.jammuuniversity.ac.in).

Sd/-  
DEAN ACADEMIC AFFAIRS

No. F.Acd/III/23/9991-10000

Dated: 13/09/2023

Copy for information & necessary action to:-

1. Dean, Faculty of Engineering
2. Principal, GCET/MBSCET/BCET/YCET/UIET
3. C.A to the Controller of Examinations
4. Joint/ Assistant Registrar (Exams Prof./Evaluation Prof./Confidential)
5. Incharge University Website

*Supriya*  
13/Sept/23  
Assistant Registrar (Academic)

*HS*  
13/9/23

*Deep*

*AP*  
13/09/23

**UNIVERSITY OF JAMMU, JAMMU**  
**COURSE SCHEME**

**B.Tech. 3<sup>rd</sup> Semester Civil Engineering**

**For Examination to be held in the Year December 2023,2024,2025, 2026.**

Contact hours/week = 22

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits	% Change
			L	T	P	Internal	External			
CEP6301	Professional Core Course	Building Construction and Materials	2	1	0	50	100	150	3	100%
CEP6302	Professional Core Course	Surveying-I	2	1	0	50	100	150	3	100%
CEP6303	Professional Core Course	Principles of Engineering Geology	2	1	0	50	100	150	3	100%
CEP6304	Professional Core Course	Water Supply Engineering	2	1	0	50	100	150	3	100%
CEP6305	Professional Core Course	Fluid Mechanics-I	2	1	0	50	100	150	3	100%
CEP6306	Professional Core Course	Structural Analysis – II	2	1	0	50	100	150	3	100%
CEP6311	Professional Core Course	Surveying Lab	0	0	2	50	-	50	1	0%
CEP6312	Professional Core Course	Material testing lab	0	0	2	50	-	50	1	0%
MOC6311	Massive Open Online course	MooCs	0	0	0	50	-	50	1	0%
<b>Total</b>			<b>12</b>	<b>6</b>	<b>4</b>	<b>450</b>	<b>600</b>	<b>1050</b>	<b>21</b>	

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Samir AK  
Head of Dept Ry

**B.Tech 3<sup>rd</sup> Semester Examination to be held in the Year December 2023, 2024, 2025, 2026.**

<b>CLASS</b>	<b>3<sup>rd</sup> SEMESTER</b>					
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>					
<b>COURSE TITLE</b>	<b>BUILDING CONSTRUCTION &amp; MATERIALS</b>					
<b>COURSE NO.</b>	<b>CEP6301</b>	<b>L</b>	<b>T</b>	<b>Marks</b>		
<b>DURATION OF EXAM</b>	<b>3 HOURS</b>	<b>2</b>	<b>1</b>	<b>Theory</b>	<b>Sessional</b>	<b>Credit</b>
				<b>100</b>	<b>50</b>	<b>3</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
<b>CO1</b>	Identify various tests that are required for quality assurance of materials in construction projects.
<b>CO2</b>	Understand the potential applications of Lime, Cement and Aggregates
<b>CO3</b>	Understand various techniques and practices on masonry construction viz. foundation, damp proofing, flooring.
<b>CO4</b>	Classify different types of doors, windows and finishes used in a building.

**Section-A**

**CEMENT:** Methods of manufacture of Portland Cement, Various types of Cement and their uses. Engineering Properties of Cement, Storage and Testing of cement as per Indian standards. (04 hrs)

**AGGREGATES:** Fine and course aggregates, physical properties of both fine and course aggregates as per Indian standards. (03 hrs)

**Structural Timber:** Classification of trees, Structure of timber, Properties, Classification of timber as per Indian standards, Characteristics of good timber, Seasoning of timber, Defects in timber, decay of timber, Suitability of timber for specific uses, testing of timber as per Indian standards. (04 hrs)

**Clay Bricks:** Composition of good brick earth, Various methods of manufacturing of bricks, testing of bricks as per Indian Standards, Indian Standard classification of Bricks. (04 hrs)

**Steel:** Mild steel, High Tensile steel, Rolled steel sections, Reinforcing steel bars, mechanical properties of steel and their testing as per Indian Standards. (03 hrs)

**Modern Materials :** Sand Lime bricks, Fly Ash bricks, Cement concrete hollow blocks, Concrete Paver blocks, Geosynthetics, Smart materials, Composite materials, Paints, Enamels and Varnishes. (04 hrs)

**Section-B**

Basic Principles underlying the Planning and Construction of Buildings.

**BRICK MASONRY:** Types of Bricks, Types of Bonds, Defects in Brick Masonry, Reinforced Brick work. (06 hrs)

**STONE MASONRY :** Classification of stone masonry Types of bonds and uses (06 hrs)

**FOUNDATIONS:** Purpose, site exploration, Methods of Testing Bearing Capacity of Soils, Types of Foundations, Combined Footing and Raft Foundation, Excavation of Foundations in water logged sites. Pile Foundation, Concrete Piles, Pile Driving, Cofferdams. (06 hrs)

**DAMP PROOFING:** Problems of dampness. Causes, Sources of Dampness. Methods of Damp Proofing, Materials used in treatment.

**FLOORING:** Brick flooring, Mud Flooring, cement Concrete Flooring, Mosaic flooring, Marble flooring. (06 hrs)

**DOORS AND WINDOWS:** Location of Doors and Windows, Size, Types of Doors and Windows, Fixtures and Fittings.

**PLASTERING:** Plastering, Lime Plaster, Cement Plaster, Finishes, Defects in Plaster Work. (05 hrs)

**BOOKS RECOMMENDED:**

1. Building Materials	By Parbin Singh	S.K Kataria & sons
2. Building Materials	By Duggal S.K	Taylor & Francis
3. Building Construction	By Sharma, S.K.	S. Chand
4. Building Construction	By Rangwala	Charotar Publishers
5. Building Materials & Construction	By Sourabh Kumar Soni	Katson Books

**NOTE:** There shall be total eight questions of 20 marks each, four from each Section. Five questions have to be attempted, selecting at least two questions from each Section. Use of calculator is allowed.

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*Sadeq Rafiq*

**B.Tech 3<sup>rd</sup> Semester Examination to be held in the Year December 2023, 2024, 2025, 2026.**

<b>CLASS</b>	<b>3<sup>rd</sup> SEMESTER</b>					
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>					
<b>COURSE TITLE</b>	<b>SURVEYING-I</b>					
<b>COURSE NO.</b>	<b>CEP6302</b>	<b>L</b>	<b>T</b>	<b>Marks</b>		
<b>DURATION OF EXAM</b>	<b>3 HOURS</b>	<b>2</b>	<b>1</b>	<b>Theory</b>	<b>Sessional</b>	<b>Credit</b>
				<b>100</b>	<b>50</b>	<b>3</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
CO1	Apply the basic principles of Surveying, take accurate measurements, make entries in the field book, plotting and adjustment of traverse.
CO2	Operate and use Surveying instruments.
CO3	Carry out profile and grid leveling for generation of profiles.
CO4	Prepare drawings from the collected field data and calculate areas, volumes of earthwork.

**Section-A**

Introduction, Purposes of surveying, Principles of surveying, Classification of surveying, Divisions of surveying, Phases of works in surveying, Types of maps, plans, scales, Errors in surveying and accuracy in measurement.

(05 hrs)

Linear Measurements of Horizontal distances, Equipments used, methods of distance measurements, Measurements by chaining, types of chain, testing and adjustment of chain.

(04 hrs)

Tapes and its Classification, Methods of Ranging of survey line, Errors in chaining, Chain and tape corrections. Chain surveying: Selection of stations, offsets, Equipments used in chain surveying, field books, obstacles in chaining, cross staff survey.

(05 hrs)

Angular measurements: Types of compass and its Components, Types of Bearing, Local attraction, testing and adjustment of compass.

(03 hrs)

Theodolite survey: Terminology used in theodolite, Fundamental axes of theodolite, Parts of theodolite, Adjustment of theodolite, Measurement of horizontal and vertical angles, Methods of theodolite traversing and errors in theodolite survey.

(06 hrs)

**Section-B**

Plane Table Surveying: Field Equipment, Adjustments of plane table, Methods of Plane Table survey, Advantages and limitations of plane table survey, Errors in plane table survey.

(06 hrs)

Leveling, Instruments used and field book recording, Methods of Levelling (height of Instrument method and Rise and Fall method), Testing of temporary and permanent adjustments in levels, Sensitivity of Bubble Tube.

(06 hrs)

Computation of areas and volumes by different methods, Methods of contouring, plotting of contours.

(05 hrs)

Total Station: Introduction, Features of total station, basic components of total station, Functions, operations involved in total station and its applications.

(05 hrs)

**BOOKS RECOMMENDED:**

1. Surveying And Levelling Vol.-I	By Kanetkar & Kulkarni	Pune Vidyarthi GrihaPrakashan
2. Surveying Vol.- I	By B.C Punmia.	Laxmi Publications
3. Surveying Vol.- I	By K. R Arora	Standard Book House
4. Surveying	By Chandak And Kumavat	S.K Kataria & Sons

**NOTE:** There shall be total eight questions of 20 marks each, four from each Section. Five questions have to be attempted, selecting at least two questions from each Section. Use of calculator is allowed.

*Samer*

*Sanjay R*

**B.Tech 3<sup>rd</sup> Semester Examination to be held in the Year December 2023, 2024, 2025, 2026.**

<b>CLASS</b>	<b>3<sup>rd</sup> SEMESTER</b>					
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>					
<b>COURSE TITLE</b>	<b>PRINCIPLES OF ENGINEERING GEOLOGY</b>					
<b>COURSE NO.</b>	<b>CEP6303</b>	<b>L</b>	<b>T</b>	<b>Marks</b>		
<b>DURATION OF EXAM</b>	<b>3 HOURS</b>	<b>2</b>	<b>1</b>	<b>Theory</b>	<b>Sessional</b>	<b>Credit</b>
				<b>100</b>	<b>50</b>	<b>3</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
<b>CO1</b>	Understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.
<b>CO2</b>	Describe the properties of minerals and rocks and their uses.
<b>CO3</b>	Classify geological structure of the rocks.
<b>CO4</b>	Apply geological considerations in Engineering projects of dams, tunnels, bridges, etc.

**Section-A**

Physical Geology; geology and its relevance to civil engineering, geological work of wind, rivers, glaciers and seas, geomorphological features resulting from their action. Minerals and Rocks, rock forming minerals, their main properties and identification. (10 hrs)

Rock classification, textures and structures and important types of igneous, Sedimentary and Metamorphic rocks, Processes involved in their formation. (06 hrs)

Petrology; formation of rocks, Engineering properties of rocks, types/field classification, weathering of rocks, origin of soils, Geology aquifers and their characteristics. (07 hrs)

**Section-B**

Structural Geology; main structural features of stratified and unstratified rocks, Folding, Faulting and Jointing. Classification and major types of folds, faults, joints and unconformities. Their significance in Engineering. (05 hrs)

Geology: Stability of Slopes, landslide and other mass movements, their causes, types and methods to control them. (05 hrs)

Engineering Geology; geological considerations in tunnels, dams, bridges, building sites; landslides. (07 hrs)

Earthquakes; basic definitions, types and causes, distribution in the world, seismic zones. (05 hrs)

**BOOKS RECOMMENDED:**

- |                                      |                    |                                  |
|--------------------------------------|--------------------|----------------------------------|
| 1. Principles of Engineering Geology | Bangar, K.M.       | Standard Publishers Distributors |
| 2. Engineering Geology               | Parbin Singh,      | Katson Publishers                |
| 3. Structural Geology                | Billings, M.P.,    | Pearson Publishers               |
| 4. Textbook of Engineering Geology   | N. Chenna Kesavulu | Trinity Press                    |

**NOTE:** There shall be total eight questions of 20 marks each, four from each Section. Five questions have to be attempted, selecting at least two questions from each Section. Use of calculator is allowed.

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Samir  
Sandip Rij

**B.Tech 3<sup>rd</sup> Semester Examination to be held in the Year December 2023, 2024, 2025, 2026.**

CLASS	3 <sup>rd</sup> SEMESTER					
BRANCH	CIVIL ENGINEERING					
COURSE TITLE	WATER SUPPLY ENGINEERING					
COURSE NO.	CEP6304	L	T	Marks		
DURATION OF EXAM	3 HOURS	2	1	Theory	Sessional	Credit
				100	50	3

COURSE OUTCOMES : On completion of the course the students will be able to:	
CO1	Estimate the quantities of water and plan their conveyance components
CO2	Assess the qualities of water and propose the treatment required.
CO3	Design various components of water treatment system
CO4	Develop an understanding about various types of water distribution systems/network.

**Section-A**

Water Engineering : Quality and Quantity Water supply systems: Development and need for planned water supply schemes in India, components of water supply system and determination of their design capacities; Source of Water: Surface and Subsurface Sources of water. intake structures-Types. (06 hrs)  
Quantity of water: Population forecast, water demand, factors affecting water consumption, fire allowances, fluctuations in demand and its effects on design of Water Supply units (05 hrs)  
Quality of water: impurities in potable water, physical, chemical and biological examination of water. Introduction to drinking water standard (BIS standard) (05 hrs)  
Treatment methods: Hardness removal, aeration, reverse osmosis, electro-dialysis, water supply network and pipe appretence – valves, testing of pipes. (06 hrs)

**Section-B**

Water Treatment: Layout of water treatment units, sedimentation – principles – design factors, coagulation-flocculation clarifier design – coagulants - feeding arrangements. (06 hrs)  
Filtration - Filtration – mechanism involved, types of filters, slow and rapid sand filtration units (features and design aspects), cleaning, limitations, operational difficulties, pressure filters: construction and operation. (06 hrs)  
Disinfection: chlorination, chemistry of chlorination, kinetics of disinfection, chlorine demand, free and combined chlorine, break point chlorination, super chlorination, dechlorination, chlorine residual, use of iodine, ozone, ultraviolet rays and chlorine dioxide as disinfectants. (06 hrs)  
Water distribution network  
Distribution system – Gravity system, Pumping System, Dual system, Layout of Distribution System – Dead End System, Grid Iron System, Ring System, Radial System, their merits and demerits. Distribution Reservoir-functions & determination of storage capacity. (05 hrs)

**BOOKS RECOMMENDED:**

- |   |                        |                   |
|---|------------------------|-------------------|
| 1. Water Supply Engineering   | By B. C. Punmia        | Laxmi Publication |
| 2. Water Supply Engineering Vol. I                                    | By Garg, S.K.          | Khanna Publishers |
| 3. Water And Wastewater Treatment                                     | By Schroeder E D,      | Mcgraw-Hill.      |
| 4. Water And Wastewater Engineering<br>Design Principles and Practice | By Mackenzie L. Davis, | Mcgraw Hill       |

**NOTE:** There shall be total eight questions of 20 marks each, four from each Section. Five questions have to be attempted, selecting at least two questions from each Section. Use of calculator is allowed.

*Samer*

*Banerjee. R. K.*  
*Sandeep K. J.*

**B.Tech. 3<sup>rd</sup> Semester Examination to be held in the Year December 2023, 2024, 2025, 2026.**

<b>CLASS</b>	<b>3<sup>rd</sup> SEMESTER</b>					
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>					
<b>COURSE TITLE</b>	<b>FLUID MECHANICS-I</b>					
<b>COURSE NO.</b>	<b>CEP6305</b>	<b>L</b>	<b>T</b>	<b>Marks</b>		
<b>DURATION OF EXAM</b>	<b>3 HOURS</b>	<b>2</b>	<b>1</b>	<b>Theory</b>	<b>Sessional</b>	<b>Credit</b>
				<b>100</b>	<b>50</b>	<b>3</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
CO1	Explain the properties of fluid & solve problems of manometers and submerged surfaces.
CO2	Explain the concept of continuity, Bernoulli's equation and its applications.
CO3	Gain knowledge about dimensional and model analysis.
CO4	Solve basic problems of flow through pipes and apply impulse momentum principle to calculate forces on vanes.

**Section-A**

Fluid: definition, distinction between solid and fluid-Units and dimensions.

Properties of Fluids: Mass density, Specific weight, Specific volume, Viscosity, bulk modulus of elasticity, Surface tension and capillarity.

Fluid statics: concept of fluid static pressure, absolute and gauge pressures, pressure measurements by manometers, forces on planes, centre of pressure, buoyancy and floatation. (08 hrs)

Fluid Kinematics: Classification and types of flow, velocity field and acceleration, continuity equation (one and three dimensional differential forms), stream line, streak line, path line, stream function, velocity potential function, flow net. (06 hrs)

Fluid dynamics: equations of motion, Euler's equation along a streamline, Bernoulli's equation, applications - venturimeter, orifice meter and Pitot tube, flow over weir-notches, flow through orifice and mouthpiece. (09 hrs)

**Section-B**

Dimensional Analysis and Model studies: Fundamental dimensions, dimensional homogeneity, Rayleigh's method and Buckingham Pi-theorem, dimensionless parameters, similitudes and model studies, distorted models. (08 hrs)

Flow through Pipes: Reynold's experiment, hydraulic and energy gradient, Darcy- Weisbach's equation, major and minor losses of flow in pipes, pipes in series and in parallel, branching of pipes, pipe networks, Hardy Cross method. (07 hrs)

Impulse Momentum Principle: Impact of Jet on flat, curved plates, Stationary and moving plates. (07 hrs)

**BOOKS RECOMMENDED:**

- |   |                      |                     |
|---|----------------------|---------------------|
| 1. Engineering Fluid Mechanics              | Garde & Mirajgaonkar | Scitech             |
| 2. Fluid Mechanics & Fluid Power            | Kumar, D.S.          | Katson Publishers   |
| 3. Fluid Mechanics & Machinery              | Modi Seth            | Standard Book House |
| 4. Theory & Applications of Fluid Mechanics | Subramanya, K.       | McGraw Hill         |

**NOTE:** There shall be total eight questions of 20 marks each, four from each Section. Five questions have to be attempted, selecting at least two questions from each Section. Use of calculator is allowed.

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Sameer Stk  
Sandeep Raj

**B.Tech 3<sup>rd</sup> Semester Examination to be held in the Year December 2023, 2024, 2025, 2026.**

CLASS	3 <sup>rd</sup> SEMESTER					
BRANCH	CIVIL ENGINEERING					
COURSE TITLE	STRUCTURAL ANALYSIS-II					
COURSE NO.	CEP6306	L	T	Marks		
DURATION OF EXAM	3 HOURS	2	1	Theory	Sessional	Credit
				100	50	3

COURSE OUTCOMES : On completion of the course the students will be able to:	
CO1	Draw S.F.D and B.M.D of different end conditions for beams.
CO2	Calculate stresses, slope and deflection in beams.
CO3	Draw Mohr circle and analyse different kind of columns under different conditions.
CO4	Calculate torsional moment, circumferential and longitudinal stresses.

**Section-A**

Shear force and Bending Moment for simply supported, cantilevers, fixed beam, continuous beams & members subjected to couples & oblique loadings. (08 hrs)

Stresses in beams, Theory of simple bending, Neutral axis, Bending stress distribution, Shear stresses, Unsymmetrical bending & shear center. (05 hrs)

Direct and Bending stresses, eccentrically loaded rectangular columns, Circular section, hollow sections, Structural sections, walls and pillars. (05 hrs)

Deflection of beams, Slope, Deflection and radius of curvature. Derivation of slope deflection formula.

Macaulay's method. (05 hrs)

**Section-B**

Principal stresses and strains, Mohr's circle. Graphical and Analytical method. Strain energy in terms of principal stresses. (05 hrs)

Columns & Struts: Short & Long Columns Euler's Theory. Effective Length, Empirical Formulae. Eccentrically Loaded Columns, Laterally Loaded Columns. (06 hrs)

Torsion of Shafts, Pure torsion, Torsional moment of resistance, composite shafts. Close coiled helical springs. (06 hrs)

Ellipse of strain, Thin cylinders, Circumferential & longitudinal stresses. (05 hrs)

**BOOKS RECOMMENDED:**

- |                           |                       |                   |
|---------------------------|-----------------------|-------------------|
| 1. Strength of Materials  | By Temoshonko & Young | CBS Publishers    |
| 2. Mechanics of Materials | By Bear & Johnson     | McGraw Hill       |
| 3. Strength of Materials  | By Ramamurtham        | Dhanpat Rai Books |
| 4. Strength of Materials  | By S.S Rattan         | McGraw Hill       |

**NOTE:** There shall be total eight questions of 20 marks each, four from each Section. Five questions have to be attempted, selecting at least two questions from each Section. Use of calculator is allowed.

Samir

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Samir



**B.Tech 3<sup>rd</sup> Semester Examination to be held in the Year December 2023, 2024, 2025, 2026.**

<b>CLASS</b>	<b>3<sup>rd</sup> SEMESTER</b>		
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>		
<b>COURSE TITLE</b>	<b>SURVEYING LAB.</b>		
<b>COURSE NO.</b>	<b>CEP6311</b>	<b>P</b>	<b>Marks</b>
		<b>2</b>	<b>Sessional</b>
			<b>50</b>
			<b>Credit</b>
			<b>1</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
CO1	Use conventional surveying tools in the field for various civil engineering projects.
CO2	Perform survey and enter the observations in the field book.
CO3	Prepare map of area using plane table surveying
CO4	Prepare L-section and X-sections with the help of level.

**LIST OF EXPERIMENTS:**

1. To locate various objects by Chain and cross staff survey.
2. To measure distance by ranging and chaining.
3. Temporary and Permanent adjustment of a Dumpy level.
4. Measurement of horizontal angles with the help of theodolite.
5. Determination of horizontal distance between two inaccessible points with theodolite.
6. To measure the area with the help of chain Surveying.
7. To measure angles with the help of a Prismatic Compass.
8. To locate given building by plane table traversing.
9. Determination of elevation of various points with Dumpy level by H.I and Rise and fall Method.
10. Plotting of longitudinal section and cross-section with the help of a level.

**Note:** Minimum of 06 experiments to be performed by students.

Sameer

Sameer <sup>PK</sup>  
Sandeep Raj

**B.Tech 3<sup>rd</sup> Semester Examination to be held in the Year December 2023, 2024, 2025, 2026.**

<b>CLASS</b>	<b>3<sup>rd</sup> SEMESTER</b>		
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>		
<b>COURSE TITLE</b>	<b>MATERIAL TESTING LAB.</b>		
<b>COURSE NO.</b>	<b>CEP6312</b>	<b>P</b>	<b>Marks</b>
		<b>2</b>	<b>Sessional</b>
			<b>50</b>
			<b>Credit</b>
			<b>1</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
CO1	Perform tests on bricks.
CO2	Determine the physical properties of cement.
CO3	Determine the physical properties of aggregates

**LIST OF EXPERIMENTS:**

1. To determine the compressive strength of brick and cement cube.
2. To determine the water absorption for the given sample of brick.
3. To determine the Effloresce and dimension tolerance for the given sample of brick.
4. To determine the consistency, initial setting time, final setting time physical properties of cement using Vicat's Apparatus.
5. To perform soundness test on cement using Le Chatlier's apparatus.
6. To find out absolute density of cement using specific gravity bottle.
7. To find the specific surface area of given combined aggregates.
8. To determine the fineness modulus of fine and course aggregates.
9. To find bulk density of aggregates and bulking factor of fine aggregates.
10. To determine the compressive strength and water absorption of tiles.

**Note:** Minimum of 06 experiments to be performed by students.

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*Sadup Rep*

**B.Tech 3<sup>rd</sup> Semester Examination to be held in the Year December 2023, 2024, 2025, 2026.**

<b>CLASS</b>	<b>3<sup>rd</sup> SEMESTER</b>				
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>				
<b>COURSE TITLE</b>	<b>MooCs</b>				
<b>COURSE NO.</b>	<b>MOC6311</b>	<b>L</b>	<b>P</b>	<b>Marks</b>	
		<b>0</b>	<b>0</b>	<b>Internal</b>	<b>Credit</b>
				<b>50</b>	<b>1</b>

**MOOCs:** A massive open online course (MOOC) is a model for delivering learning content to any person who wants to take a course by means of the web.

The Students have to undergo MooCs for a duration of 4-6 weeks during semester break after the completion of 2<sup>nd</sup> semester on Use and applications of AutoCADD in Civil Engineering. which include operation, various commands, draw Plan, Elevation and Cross-section of buildings. A report of the same should be submitted at the beginning of the 3<sup>rd</sup> semester along with the course completion certificate. The department shall evaluate the student on the basis of the report, presentation and the viva-voce examination conducted by the departmental committee of at least three faculty members constituted by Head of the Department.

Distribution of Marks as per the University statutes:

- 1) Training Report (20-25 pages) = 40%
- 2) Presentation = 30%
- 3) Viva- voce = 30%

Samir

Samir. P. K.  
Sandeep Bip

**UNIVERSITY OF JAMMU, JAMMU**

**COURSE SCHEME**

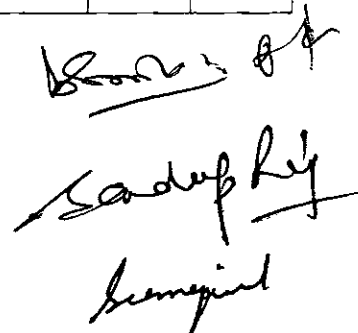
**B.Tech. 4<sup>th</sup> Semester Civil Engineering**

**For Examination to be held in the Year May 2024,2025, 2026,2027.**

Contact hours/week = 26

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits	% Change
			L	T	P	Internal	External			
BST8403	Basic Science Course	Mathematics – III	2	1	0	50	100	150	3	10%
CEP6401	Professional Core Course	Surveying-II	2	1	0	50	100	150	3	100%
CEP6402	Professional Core Course	Structural Analysis –III	2	1	0	50	100	150	3	100%
CEP6403	Professional Core Course	Fluid Mechanics-II	2	1	0	50	100	150	3	100%
CEP6404	Professional Core Course	Waste Water Engineering	2	1	0	50	100	150	3	100%
MOC6401	Massive Open Online Course	SWAYAM/NPTEL	3	0	0	100	0	100	3	100%
NCC3401	Non Credit Course	Cyber Ethics And Laws	2	0	0	Satisfactory/Unsatisfactory			-	100%
CEP6411	Professional Core Course	Fluid Mechanics Lab	0	0	2	50	0	50	1	0%
CEP6412	Professional Core Course	Structural Analysis Lab	0	0	2	50	0	50	1	100%
CEP6413	Professional Core Course	Environment Engineering – Lab	0	0	2	50	0	50	1	100%
<b>Total</b>			<b>15</b>	<b>5</b>	<b>6</b>	<b>500</b>	<b>500</b>	<b>1000</b>	<b>21</b>	

Samer

  
 Sandeep K. Singh  
 Principal

**B.Tech 4<sup>th</sup> Semester Examination to be held in the Year May 2024,2025, 2026,2027.**

<b>CLASS</b>	<b>4<sup>th</sup> SEMESTER</b>					
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>					
<b>COURSE TITLE</b>	<b>SURVEYING-II</b>					
<b>COURSE NO.</b>	<b>CEP6401</b>	<b>L</b>	<b>T</b>	<b>Marks</b>		
<b>DURATION OF EXAM</b>	<b>3 HOURS</b>	<b>2</b>	<b>1</b>	<b>Theory</b>	<b>Sessional</b>	<b>Credit</b>
				<b>100</b>	<b>50</b>	<b>3</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
<b>CO1</b>	<b>Understand basic concept of geodetic surveying.</b>
<b>CO2</b>	<b>Carry out trigonometric and tacheometric survey.</b>
<b>CO3</b>	<b>Select the correct, best suited curve and set the curve for road/ railway project.</b>
<b>CO4</b>	<b>Understand the basic concepts of Remote sensing, and GIS.</b>

**Section-A**

**Trigonometric leveling:** Introduction, Height and distances cases of trigonometric leveling, Curvature and refraction, axis signal correction, Determination of difference in elevation by single and reciprocal observations. (07 hrs)

**Tachometry:** Objectives, uses, features, Instruments used, Principle of stadia method, different systems of tachometric measurements, Methods of tachometric, Anallactic lens, advantages of tachometric, Errors in tachometric survey. (06 hrs)

**Omitted measurements:** Different cases of omitted measurement in Traverse survey and methods of balancing of traverse. (04 hrs)

**Triangulation:** Geodetic surveying, Triangulation systems, classification, strength of figure, selection of triangulation stations, reconnaissance, signals and towers, base line measurement, satellite station, base net method of least square. distribution of error of field measurement. (06 hrs)

**Section-B**

**Curves:** Definitions, Designation of curve, Elements of simple curve, types of curves, Setting out of curves by ordinates from long chord, successive bisection of arcs, by offsets from tangents, by deflection distances, by Rankines method of tangential angles, Tacheometric method, Elements of compound curve and setting out of compound curve, reverse curve and its elements, transition curve, length of transition curve, length of vertical curve and sight distance. (10 hrs)

**Remote Sensing:** Elements of remote sensing system, basic principle of remote sensing, Components of remote sensing, types of remote sensing, Applications and advantages of remote sensing, total station and its applications. (07 hrs)

**Global Information System(GIS) :** Definition, and Objectives, Components of GIS, sub systems of GIS, GIS flow chart, Advantages of GIS, application of GIS. (05 hrs)

**BOOKS RECOMMENDED :**

- |                                    |                         |                                |
|------------------------------------|-------------------------|--------------------------------|
| 1. Surveying and Levelling Vol.-II | By Kanetkar & Kulkarni. | Pune Vidyarthi Griha Prakashan |
| 2. Surveying Vol.- II              | By B:C Punmia.          | Laxmi Publications             |
| 3. Surveying Vol.- II              | By K.R Arora            | Standard Book House            |
| 4. Geographic Information Systems  | Chang.T.K.              | McGraw Hill                    |
| 5. Remote Sensing And GIS          | Basudeb Bhatta          | Oxford Univ. Press             |

**NOTE:** There shall be total eight questions of 20 marks each, four from each Section. Five questions have to be attempted, selecting at least two questions from each Section. Use of calculator is allowed.

*Samer*  
*Boone*  
*Sadaphi*

**B.Tech 4<sup>th</sup> Semester Examination to be held in the Year May 2024,2025, 2026,2027.**

<b>CLASS</b>	<b>4<sup>th</sup> SEMESTER</b>					
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>					
<b>COURSE TITLE</b>	<b>STRUCTURAL ANALYSIS-III</b>					
<b>COURSE NO.</b>	<b>CEP6402</b>	<b>L</b>	<b>T</b>	<b>Marks</b>		
<b>DURATION OF EXAM</b>	<b>3 HOURS</b>	<b>2</b>	<b>1</b>	<b>Theory</b>	<b>Sessional</b>	<b>Credit</b>
				<b>100</b>	<b>50</b>	<b>3</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
CO1	State general theorems and analyse beams, plane frames using energy and deformation methods.
CO2	Draw shear force and bending moment diagrams for fixed as well as continuous beams and find deflections in beams using different methods
CO3	Analyse indeterminate structures using various classical methods and draw shear force and bending moment diagrams.
CO4	Draw Influence Line Diagrams of the beams, trusses subjected to moving loads.

**Section-A**

Principle of Virtual work, Maxwell's reciprocal theorem. First theorem of Castigliano, Deflection of Truss Joints (Determinate Trusses) by Maxwell's Method.. Statically indeterminate Structures, Second Theorem of Castigliano and its applications for beams and portal frames. Degree of redundancy of structures, Forces in members of redundant trusses (Single Degree). (12 hrs)

Fixed & Continuous Beams: Fixed beams, bending moment diagrams, Fixed beams with supports at different levels, Advantages & disadvantages. Continuous beams: Clapyron's three moment theorem. Deflection of Determinate structures: cantilevers, simply supported beams using  
(a) Moment area method  
(b) Conjugate beam method (11 hrs)

**Section-B**

Analysis of continuous beams and frames (having indeterminacy up to 03 degrees) including sinking and rotation yielding of supports using  
(a) Slope deflection method  
(b) Moment distribution method (10 hrs)  
Influence lines: Basic concepts of influence lines, application of Muller Breslau's principle. Rolling loads: Use of influence lines for determination of shear force and bending moment in simply supported beams, overhanging beams, compound beams. Influence lines for truss reactions and members forces for plane determinate trusses. (12hrs)

**BOOKS RECOMMENDED :**

- |                                      |                |                       |
|--------------------------------------|----------------|-----------------------|
| 1. Basic structural Analysis         | By Reddy, C.S  | McGraw Hill           |
| 2. Theory of Structures              | Ramamurtham, S | DhanpatRai Publishing |
| 3. Indeterminate Structures          | Wang, C.K      | McGraw Hill           |
| 4. Theory and Analysis of Structures | Jain & Arya    | Nem Chand & Bros      |

**NOTE:** There shall be total eight questions of 20 marks each, four from each Section. Five questions have to be attempted, selecting at least two questions from each Section. Use of calculator is allowed.

*Samir*

*Bonnie*  
*Sadeep Raj*

**B.Tech 4<sup>th</sup> Semester Examination to be held in the Year May 2024,2025, 2026,2027.**

<b>CLASS</b>	<b>4<sup>TH</sup> SEMESTER</b>					
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>					
<b>COURSE TITLE</b>	<b>FLUID MECHANICS-II</b>					
<b>COURSE NO.</b>	<b>CEP6403</b>	<b>L</b>	<b>T</b>	<b>Marks</b>		
<b>DURATION OF EXAM</b>	<b>3 HOURS</b>	<b>2</b>	<b>1</b>	<b>Theory</b>	<b>Sessional</b>	<b>Credit</b>
				<b>100</b>	<b>50</b>	<b>3</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
CO1	Demonstrate the concepts of Laminar flow through pipes and Boundary layer theory.
CO2	Analyze and perform calculations on pipe flow problems involving turbulent flow, understand the concept of friction factor.
CO3	Analyze water hammer phenomenon in closed conduits and develop an understanding about hydraulic characteristics of turbines.
CO4	Analyze and perform calculations on open channel flows, compute water surface profiles and hydraulic jump characteristics.

**Section-A**

Laminar Flow: Derivation of Navier Stokes Equations for laminar flow. Hagen-Poiseuille's Equation for Laminar flow in circular pipes, Stokes Law, Darcy's Law. (07 hrs)

Boundary Layer Theory: Definition and Characteristics development of boundary layer over a flat plate. Laminar Boundary Layer, Turbulent Boundary Layer, displacement, energy and momentum thickness Hydrodynamically Smooth and Rough Surfaces, Momentum Integral Equation, boundary layer separation and control. (07 hrs)

Turbulent Flow : Characteristics of turbulent flow, semi empirical equations to estimate shear stress in turbulent flow using Boussinesq' theory, Prandtl's mixing length theory, Velocity distribution in Turbulent Flow, friction factor for commercial Pipes, Moody's diagram.

Water hammer phenomenon, water hammer action for gradual and sudden closure. conditions for sudden closure of rigid and flexible pipes. (08 hrs)

**Section-B**

Turbines: Classifications of turbine, Pelton Wheel, Francis Turbine and Kaplan Turbine, Specific speed, Selection of Turbine. (08 hrs)

Open Channel Flow: Types and regimes of flow, velocity distribution in open channel, Chezy's and Manning's uniform flow equations, most efficient channel section, Specific energy, alternate depths, critical flow. (08 hrs)

Dynamic equation of Gradually varied flow, determination of GVF profiles, Hydraulic jump, flow through transitions (local bed rise and width contraction), Afflux and Back water curve. Channel Slopes and flow profiles. (08 hrs)

**BOOKS RECOMMENDED :**

1	Fluid Mechanics and Fluid Power Engineering	Kumar, D.S.	S.K.Kataria & Sons Publishers.
2	Open channel Flow	K. Subramanaya	Tata McGraw Hill Pub. Co.
3	Flow Through Open Channels	RangaRaju, K.G.	McGraw Hill Publishing Company Ltd.
4	Fluid Mechanics & Machinery	Modi Seth	Standard Book House

**NOTE:** There shall be total eight questions of 20 marks each, four from each Section. Five questions have to be attempted, selecting at least two questions from each Section. Use of calculator is allowed.

Samer

Samir  
or  
Sandeep Raj

**B.Tech 4<sup>th</sup> Semester Examination to be held in the Year May 2024,2025, 2026,2027.**

<b>CLASS</b>	<b>4<sup>th</sup> SEMESTER</b>					
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>					
<b>COURSE TITLE</b>	<b>WASTE WATER ENGINEERING</b>					
<b>COURSE NO.</b>	<b>CEP6404</b>	<b>L</b>	<b>T</b>	<b>Marks</b>		
<b>DURATION OF EXAM</b>	<b>3 HOURS</b>	<b>2</b>	<b>1</b>	<b>Theory</b>	<b>Sessional</b>	<b>Credit</b>
				<b>100</b>	<b>50</b>	<b>3</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
CO1	Estimate sewage generation and design sewer system including Sewage pumping stations.
CO2	Determine the characteristics and composition of sewage.
CO3	Design the unit operations and processes that are used in sewage treatment.
CO4	Comprehend methods of sewage disposal and sludge treatment.

**Section-A**

Importance of sanitation, Systems of sewerage – separate, combined and partially separate. Estimation of waste water and storm water, quantity of sanitary sewage, population equivalent -Hydraulic design of sewers, sewer appurtenances -corrosion in sewers – prevention and control, Construction and testing of sewer lines. (12 hrs)

Physical, Chemical & Biological characteristics of sewage and their significance. Quality Parameters: BOD, COD, TOC, Solids, DO, oil and greases. Disposal of sewage by dilution – self-purification of streams. Sewage disposal by irrigation. (10 hrs)

**Section-B**

Classification of treatment method, Primary treatment: Screens: Types of screens-coarse screen, fine screen and micro strainer, head loss through screens, disposal of screenings. Grit Chamber: Sources of grit, Velocity control in grit chamber. Design, Disposal of grit, oil and grease removal. (11 hrs)

Secondary treatment: activated sludge process, trickling filter, Sludge digestion and drying beds. Stabilization pond, aerated lagoons, Septic tank, Soakage systems, Imhoff tank, UASB reactor, Sludge disposal methods, (12hrs)

**Technical tour & report: within semester visit to sewage treatment plant and prepare report.**

**BOOKS RECOMMENDED:**

1. Waste Water Engineering Metcalf and Eddy. McGraw Hill
2. Sewage Disposal and Air Pollution Engg. S.K. Garg. Khanna Publication
3. Water and Wastewater Engineering:, Mackenzie L. Davis, McGraw Hill  
Design Principles and Practice
4. Manual on Sewerage and Sewage Treatment: Ministry of Urban Dev., New Delhi.

**NOTE:** There shall be total eight questions of 20 marks each, four from each Section. Five questions have to be attempted, selecting at least two questions from each Section. Use of calculator is allowed.

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or  
Samer



**B.Tech 4<sup>th</sup> Semester Examination to be held in the Year May 2024,2025, 2026,2027.**

<b>CLASS</b>	<b>4<sup>th</sup> SEMESTER</b>			
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>			
<b>COURSE TITLE</b>	<b>SWAYAM / NPTEL</b>			
<b>COURSE NO.</b>	<b>MOC6401</b>	<b>L</b>	<b>Marks</b>	
		<b>3</b>	<b>Sessional</b>	<b>Credit</b>
			<b>100</b>	<b>3</b>

The student shall register for a 12 week SWAYAM / NPTEL course offered by IIT Madras, out of the list of courses floated by SWAYAM/NPTEL around the time of commencement of the semester. However, the selected NPTEL course should not be similar to the regular courses offered as a part of the department curriculum. The choice of the course needs to be duly endorsed by the Departmental Academic Committee.

The overall monitoring of the NPTEL course will be under the supervision of the teacher in-charge of the department.

The NPTEL/SWAYAM certification course comprises of Assignments (25%) and Proctor Examination (Online examination MCQ's based = 75%) conducted at the end of the semester by IIT Madras as per the schedule.

The marks obtained by the student in the NPTEL/SWAYAM certification course will be tabulated by the concerned department.

*Note: - In case the student does not pass the certification exam or remains absent in the proctor examination, no certificate will be given to the candidate by the NPTEL, the student will be deemed to have failed in the course. The student will have to register again for the next semester NPTEL course and pass the examination along with a certificate.*

Samer

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ft  
Randip R

**B. Tech 4<sup>th</sup> Semester Examination to be held in the Year May 2024,2025, 2026,2027.**

<b>CLASS</b>	<b>4<sup>TH</sup> SEMESTER</b>		
<b>BRANCH</b>	<b>CIVIL ENGINEERING / E &amp; C ENGINEERING</b>		
<b>COURSE TITLE</b>	<b>Cyber Ethics And Laws</b>		
<b>COURSE NO.</b>	<b>NCC3401</b>	<b>L</b>	<b>Marks</b>
		<b>2</b>	<b>Satisfactory/ Unsatisfactory</b>

<b>COURSE OUTCOMES : At the end of the course the student will be able to:</b>	
<b>CO1</b>	Understand the basic concepts of Cyber Ethics &Laws.
<b>CO2</b>	Understand about the constitutional and Human Rights Issues in Cyber space
<b>CO3</b>	Understand Cyber Crimes and Legal Framework
<b>CO4</b>	Understand about the limitations and current issues in the area.

**Section-A**

Ethics in Cyber Space, Core Values and Virtues, Dimensions of Cyber Ethics in Cyber Society, Cyber Ethics by Norms, Laws and Relations, Principle & Significance of Cyber Ethics, Ethics in Information Society.

Computer and its impact in Society, Overview of Computer and Web Technology, what are Cyber Laws, Need for Cyber Laws, Cyber Jurisprudence at International and Indian Level. (23 hrs)

**Section-B**

Objectives, Importance of Cyber Laws, Right to Access Cyberspace-Access to internet, Right to privacy, Right to data protection, Advantages and Disadvantages

Cyber Crime against Individual, Institution and State, Types of Cyber Crimes, Cyber Crimes and Legal Framework

Limitations and Current Issues relating Cyber Ethics & Cyber Laws in the Society (22 hrs)

**BOOKS RECOMMENDED:**

1. Cyber Laws Justice Yatindra Singh
2. Cyber Laws and Crimes Simplified Adv. Prasant Mali
3. Cyber Ethics 4.0 Christoph Stuckelberger and Pavan Duggal

**NOTE:** This is a Mandatory Non-Credit Course. Two objective papers will be conducted internally by the department. The students are required to score at least 40% or above in totality to be considered qualified in the course.

*Samer*

*B. Tech*  
*+*  
*Sandeep R*

**B.Tech 4<sup>th</sup> Semester Examination to be held in the Year May 2024,2025, 2026,2027.**

<b>CLASS</b>	<b>4<sup>th</sup> SEMESTER</b>		
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>		
<b>COURSE TITLE</b>	<b>FLUID MECHANICS LAB.</b>		
<b>COURSE NO.</b>	<b>CEP6411</b>	<b>P</b>	<b>Marks</b>
		<b>2</b>	<b>Sessional</b>
			<b>50</b>
			<b>Credit</b>
			<b>1</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
<b>CO1</b>	<b>Verify Bernoulli's and Impulse Momentum equations.</b>
<b>CO2</b>	<b>Measure flow in pipes and determine frictional losses.</b>
<b>CO3</b>	<b>Calculate discharge/ flow rate in open channels.</b>
<b>CO4</b>	<b>Characterize the type of flow.</b>

**List of Practicals :**

1. To verify Bernoulli's Theorem.
2. To find Metacentric height of a floating body.
3. To verify Impulse - Momentum Equation.
4. To determine  $C_C$ ,  $C_V$  and  $C_d$  for an Orifice/Mouthpiece.
5. Calculation of friction factor 'f' for a given pipe.
6. To determine  $C_d$  for Venturimeter and Orificemeter.
7. To study Reynold's Experiment.
8. To determine  $C_d$  for Notch/Weir.
9. To determine Coefficient of Drag on a immersed body.
10. To visualise the flow patterns for irrotational flow around aerofoil using Hele Shaw apparatus.

**Note:** Minimum of 06 experiments to be performed by students.

Samer

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**B.Tech 4<sup>th</sup> Semester Examination to be held in the Year May 2024,2025, 2026,2027.**

<b>CLASS</b>	<b>4<sup>TH</sup> SEMESTER</b>		
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>		
<b>COURSE TITLE</b>	<b>STRUCTURAL ANALYSIS LAB</b>		
<b>COURSE NO.</b>	<b>CEP6412</b>	<b>P</b>	<b>Marks</b>
		<b>2</b>	<b>Sessional</b>
			<b>50</b>
			<b>Credit</b>
			<b>1</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
<b>CO1</b>	Determine the horizontal thrust in an arch.
<b>CO2</b>	Determine the deflection and flexure rigidity in a beam.
<b>CO3</b>	Verify the Maxwell's and moment area theorem.
<b>CO4</b>	Calculate sway and buckling load in portal frames.

**LIST OF EXPERIMENTS:**

1. To find horizontal thrust and draw the influence line for horizontal thrust for a two hinged arch.
2. Calibration of electrical strain gauge and determination of gauge factor.
3. To find deflection in fixed continuous beams.
4. To find value of flexural rigidity (EI) for a given beam and compare it with theoretical value.
5. To verify moment area theorem.
6. To verify the Maxwell's reciprocal theorem for beam.
7. To Study the behavior of a portal frames under different end conditions.
8. To measure strain in cantilever beam with the help of strain gauge.
9. Sway in portal frames-demonstration.
10. To study the behavior of different types of struts and to calculate Euler's buckling load.

**Note:** Minimum of 06 experiments to be performed by students.

Samer

Bonus  
A.A.  
Kaduppa

**B.Tech 4<sup>th</sup> Semester Examination to be held in the Year May 2024,2025, 2026,2027.**

<b>CLASS</b>	<b>4<sup>TH</sup> SEMESTER</b>		
<b>BRANCH</b>	<b>CIVIL ENGINEERING</b>		
<b>COURSE TITLE</b>	<b>ENVIRONMENTAL ENGINEERING LAB</b>		
<b>COURSE NO.</b>	<b>CEP6413</b>	<b>P</b>	<b>Marks</b>
		<b>2</b>	<b>Sessional</b>
			<b>Credit</b>
			<b>50</b>
			<b>1</b>

<b>COURSE OUTCOMES : On completion of the course the students will be able to:</b>	
<b>CO1</b>	Acquire capability to conduct experiments and estimate the concentration of different parameters.
<b>CO2</b>	Comprehend the environmental significance and application in environmental engineering practice
<b>CO3</b>	Compare the result with standards and discuss based on the purpose of analysis.
<b>CO4</b>	Determine the type and degree of treatment for water and wastewater.

**LIST OF EXPERIMENTS:**

1. To determine the pH value and conductivity of a given sample
2. To find out total dissolved solid, settleable solids and suspended solids of the given sample .
3. To determine the carbonate, bicarbonate, and hydroxide alkalinity of a sample.
4. To find out the concentration of chlorides in the given sample
5. To determine Residual Chlorine in the given sample
6. To estimate the hardness of the given sample of water by standard EDTA method
7. To determine COD of the given waste water sample.
8. To estimate the biological Oxygen demand of the given wastewater sample.
9. To determine DO of the given sample.
10. To determine Total Coliform in the given sample

**Note:** Minimum of 06 experiments to be performed by students.

*Samer*

*Samir*  
*Sandip R.*