Teaching and Evaluation scheme for
Second Year B.Tech Program in Civil Engineering Semester – III

Sr. No	Curriculum Component	Course Code	Course	Teaching Scheme				Evaluation Scheme			
				L	T	P	Credit	Component	Marks		
									Max	Min for Passing	
1	BS	UCVL 0301	Engineering Mathematics III	3	1	0	4	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
2	ES	UCVL 0302	Solid Mechanics	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
3	ES	UCVL 0303	Engineering Hydraulics	3	1	0	4	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
4	PC	UCVL 0304	Engineering Surveying	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
5	PC	UCVL 0305	Building Sciences & Services	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
6	ES	UCVL 0331	Solid Mechanics Lab	0	0	2	1	ISE	25	10	
								ESE OE	25	10	
7	ES	UCVL 0332	Engineering Hydraulics Lab	0	0	2	1	ISE	25	10	
								ESE POE	50	20	
8	PC	UCVL 0333	Engineering Surveying	0	0	4	2	ISE	25	10	
								ESE POE	50	20	
9	PC	UCVL 0334	Building Sciences & Services Lab	0	0	2	1	ISE	50	20	
10		UCVL 0361	Environmental Studies (Audit Course)	2	0	0	0		100	40	
			Total	**17**	**2**	**10**	**22**	**Total Contact Hrs**			**29**

Title of the Course:	**Engineering Mathematics-III**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0301**	**3**	**1**	**-**	**4**

Course Pre-Requisite:

Basic terminologies of differential equations, vector algebra, concepts of probability, rules and formulae of derivative integration.

Course Description:

This Course contains linear differential equations, vector calculus, probability distributions, Laplace Transform.

Course Learning Objectives:

1. To develop abstract, logical and critical thinking and the ability to reflect critically upon their work.
2. To study various mathematical tools like differential equations, integral transforms, vector calculus, probability and to devise engineering solutions for given situations.
3. The student must be able to formulate a mathematical model of a real life and engineering problem, solve and interpret the solution in real world.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Find directional derivatives and apply knowledge of vector differentiation to find curl and divergence of vector fields.	I	Cognitive
CO2	Define the Laplace transform and use it to get solution of boundary value problems .	I	Cognitive
CO3	Solve linear differential equations with constants coefficients and apply them to realistic problems.	III	Cognitive
CO4	Construct analytic function and harmonic function. Also find the complex integration.	III	Cognitive

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	1	-	-	-	-	-	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	2
CO4	3	2	-	-	-	-	-	-	-	-	-	2

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one EndSemester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% Weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit 1: Linear Differential Equations with Constant Coefficients and Its Applications 1.1 Definition, general form, complete solution 1.2 Rules for finding complementary function 1.3 Rules for finding particular integral 1.4 Applications to Bending beams, strut, columns etc.	**8 Hrs.**
Unit 2: Vector Calculus 2.1 Differentiation of vectors 2.2 Velocity and acceleration 2.3 Gradient of scalar point function and Directional derivative 2.4 Divergence of vector point function 2.5 Curl of a vector point function 2.6 Solenoidal and Irrotational vector fields	**7 Hrs.**
Unit 3: Curve Fitting 3.1 Lines of Regression of bivariate data 3.2 Fitting of curves by Least – square method 3.2.1 Fitting of Straight lines 3.2.2 Fitting of Parabola 3.2.3 Fitting of Exponential curves.	**6 Hrs.**

Unit 4: Probability Distributions 4.1 Random variable 4.2 Probability mass function and probability density function 4.3 Binomial distribution 4.4 Poisson distribution 4.5 Normal distribution	**6 Hrs.**
Unit 5: Laplace Transform 5.1 Definition, transforms of elementary functions, properties of Laplace transform 5.2 Transforms of derivative and integral 5.3 Inverse Laplace transform 5.4 Inverse Laplace transforms by using partial fractions and Convolution theorem 5.5 Solution of linear differential equations with constant coefficients by Laplace transform method	**8 Hrs.**
Unit 6: Calculus of Complex Functions 6.1 Functions of complex variable 6.2 Analytic function, necessary and sufficient condition for f(z) to be analytic 6.3 Milne – Thomson method to determine analytic function f(z) 6.4 Harmonic function 6.5 Complex integration, Cauchy's theorem and Cauchy's integral formula.	**7 Hrs.**

Recommended Textbooks:

1. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi.
2. A Text Book of Applied Mathematics, Vol. I and vol. II by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

References Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
2. Advanced Engineering Mathematics by H. K. Dass, S. Chand, New Delhi.
3. A text book of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd., New Delhi.
4. Mathematics for Engineers Vol-I & Vol-II by Rakesh Dube, Narosa Publishing House.

Unit wise Measurable students Learning Outcomes:

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

Unit 1:

a. Solve linear differential equations with constant coefficients.
b. Solve the homogenous linear differential equations.
c. Apply the knowledge of linear differential equation to solve differential equation arising in Civil engineering.

Unit 2:

a. Differentiate vector quantity.
b. Find the directional derivative of scalar point function.
c. Find the divergence and curl of vector point function.
d. Determine solenoidal and irrotational fields with the help of divergence and curl

Unit 3:

a. Find Lines of Regression of bivariate data
b. Best fit of curve by Least square method

Unit 4:

a. Verify the function as probability mass and density Function.
b. Use various probability distributions in solving physical and engineering problems.

Unit 5:

a. Define Laplace transforms, properties of Laplace transform
b. Find inverse Laplace transform by partial fraction, convolution theorem
c. Solve linear differential equation with constant coefficients.

Unit 6:

a. Determine analytic faction by Milne Thomson method
b. Apply Cauchy's theorem& Cauchy's integral formula to evaluate complex integration..

Title of the Course:	**Solid Mechanics**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0302**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Applied Mechanics, Engineering Mathematics

Course Description:

Solid Mechanics forms a core subject which is taught to students of all non-circuit disciplines of engineering. The study of this subject is aimed at developing a thorough understanding of the basic material behavior through principles of mechanics & its applications to solve engineering problems.

Course Learning Objectives:

1. To explain the important engineering properties of materials and behaviour.
2. To explain the behaviour of materials subjected to pure axial loading.
3. To explain the behaviour of materials subjected to pure transverse loading.
4. To explain the behaviour of materials subjected to pure torsion.
5. To make aware of basic energy concepts.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Interpret various engineering materials on basis of their properties and behaviour to loading.	2	Cognitive
CO2	Construct straining action / stress distribution diagrams for a structure / section.	3	Cognitive
CO3	Apply energy principles to the loading – deformation behaviours of structural elements.	3	Cognitive
CO4	Analyze the stress, strain and deformation of elastic bodies under external actions.	4	Cognitive

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	2	1	3	-	-	-	-	-	-	-	2
CO2	2	3	1	2	-	2	-	-	-	-	-	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2
CO4	2	3	2	2	-	2	-	-	-	-	-	2

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one EndSemester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit 1: Simple Stress and Strain Engineering properties of different materials, simple stress and strain, and Hook's law, elastic behaviour of the body under external actions, simple and complementary shear stresses, temperature stresses, elastic constants, Relation among elastic constants, Stress strain behaviour of mild and tor steel. Simple Sections, Compound sections, composite sections, uni-axial loading, biaxial and triaxial loading.	**10 Hrs.**
Unit 2: SFD and BMD of Statically Determinate Beams Shear force diagrams and bending moment diagrams for concentrated loads, couples, uniformly distributed loading and uniformly varying loading in Simply supported beams, cantilever beams, overhanging beams, compound beams.	**6 Hrs.**
Unit 3: Bending Stress in Beams Concept of pure bending, Derivation of flexural formula, Section modulus, Moment of resistance, Lever arm, Simple design Problems for rectangular and flanged Sections.	**6 Hrs.**
Unit 4: Shear Stress in Beams Derivation of shear stress formula, Stress distribution diagrams for Standard shapes, Relation between maximum and average shear stresses for rectangular, triangular, diamond and circular sections, simple design problems for rectangular, flanged and composite shapes.	**6 Hrs.**

Unit 5: Analysis of Circular Shafts Subjected to Torsion Solid and Hollow circular shafts, Torsion formula, Polar modulus of Shaft, Power Transmitted through Shaft, Comparison of shafts.	**6 Hrs.**
Unit 6: Concepts of Strain Energy Work Energy Principle, Strain energy due to different types of axial loadings: Gradual, Sudden and Impact; Strain Energy due to different types of Stresses, Strain energy due to different types of actions	**5 Hrs.**

Recommended Textbooks:

1. Mechanics of Structure (Vol. I and II) – Dr.H.J.Shaha and Junnarkar S.B., Charotar Publication.
2. Mechanics of Materials Vol I and II – B.C.Punmia and Jain, Laxmi Publications.
3. Strength of Materials - S Ramamrutham, Dhanapat Rai Publications.
4. Strength of Materials - Bhavikatti S.S., New Age Publications.
5. Strength of Materials - R.K.Rajput., S.Chand Publications.
6. Strength of Materials - R.K.Bansal., Laxmi Publications.
7. Structural Analysis - Bhavikatti S.S, Vikas Publications house New Delhi.
8. Strength of Material – Debabrata Nag, A. Chanda, 2nd Edition, and Wiley India publication.

References Books:

1. "Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
2. "Introduction to Mechanics of Solids" - J.B. Popov, Prentice – Hall publication.
3. "Mechanics of Materials" - Gere and Timoshenko, CBS publishers.
4. "Mechanics of Materials" - R.C. Hibbler, Pearson Education.
5. "Mechanics of Material" - Beer and Johnston, M.

Unit wise Measurable students Learning Outcomes:

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

1. List the different engineering properties and behavior of the materials and
2. Calculate the response of elastic bodies to pure axial loading.
3. Evaluate response (SFD and BMD) of determinate beams under different external loading.
4. Calculate the response of elastic bodies under pure bending.
5. Calculate the response of elastic bodies under pure shear.
6. Calculate the response of elastic bodies under torsion.
7. Calculate strain energy due to different types of actions.

Title of the Course:	**Engineering Hydraulics**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0303**	**3**	**1**	**-**	**4**

Course Pre-Requisite:

A Student should undergone a course and understanding in subjects viz. Applied Mechanics , Physics , Mathematics

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 analyzed 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 analyze practical fluid flow phenomenon and apply basic principles / concepts in fluid mechanics to solve real life situations.

Course Learning Objectives:

1. To know the classification of fluids / flows and understand fluid properties and their importance in fluid flow phenomenon.
2. To Understand the basic principles of fluid flow phenomenon and flow measurements through pipe and open channel
3. To Apply principles of hydrostatics and hydrodynamics in the analysis of fluid flow phenomenon
4. To identify, formulate, and solve engineering problems related to fluid mechanics

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Classify the various types of fluids / flows and their characteristics by taking into consideration fundamental concepts of fluid mechanics.	**(L-2)**	
CO2	Analyze problems to compute forces on fluid in steady state and in motion through numerical problems.	**(L-4)**	
CO3	Demonstrate the use of basic laws and equations to derive functional relationships between various flow parameters	**(L-5)**	
CO4	Adapt appropriate methods to work out practical fluid flow problems using analytical and computational methods.	**(L-6)**	

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	1	-	-	-	-	-	-
CO3	-	-	2	-	-	3	1	-	-	-	-	-
CO4	-	3	-	3	-	-	-	1	-	-	-	-

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one EndSemester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three modules)
- ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1:--- **8 Hrs.**

A. Introduction: Physical Properties of Fluids (Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity: Dynamic and Kinematic Viscosity, Compressibility, Surface tension, Capillary Effect, Vapour Pressure and Cavitation), Newtons law of viscosity, Types of Fluids.

B. Fluid Statics: Types of Pressure, Pascal's Law, Hydrostatic Law, Pressure Measurement Devices, Pressure Head, Pressure Diagram, Centre of Pressure, Forces on Plane and Curved Surfaces, Buoyancy and Floatation: Archimedes's Principle, Metacentre, Stability of Submerged and Floating Bodies.

Unit 2:--- **A. Fluid Kinematics:** Types of Flows, Stream lines, Equipotential lines, Steak Line, Path Line, Stream Tube, Stream Bundle, Stream Function and Velocity Potential Function, Flow Net- (Properties and Uses), Continuity Equation (3-D Cartesian Form). **B. Fluid Dynamics:** Forces Acting on Fluid in Motion, Euler's Equation along a Streamline, Bernoulli's Theorem, Limitations , Bernoulli's Applications: Venturimeter (Horizontal andVertical), Orificemeter, Orifices, Time required for Emptying the Tank, Concept of HGL and TEL.	**6 Hrs.**
Unit 3:--- **A. Flow through Pipes** : Reynold's Experiment, Hazen Poisulle's Equation for Viscous Flow through Circular Pipes, Major and Minor Losses, Concept of Equivalent Pipe, Dupit's Equation , Pipes in Series, Parallel and Syphon,	**6 Hrs.**
Unit 4:--- **A. Uniform Flow in Open Channel:** Classification of Flows In Open Channel, Geometric Elements, Chezy's and Manning's Formula, Uniform Flow Computations, Hydraulically Efficient Section (Rectangular, Triangular, Trapezoidal), Depth Energy Relationship in OCF	**7 Hrs.**
Unit 5:--- **A. Gradually Varied Flow (GVF):** Definition, Classification of Channel Slopes, Dynamic Equation of GVF (Assumption and Derivation), Classification of GVF Profiles- Practical Examples, Direct Step Method of Computation of GVF Profiles **B. Rapidly Varied Flow (RVF):** Definition, Hydraulic Jump- Phenomenon, Conjugate Depth Relationship, Characteristics, Uses and Types of Hydraulic Jump, Hydraulic Jump as an Energy Dissipater	**8 Hrs.**
Unit 6:--- **A. Flow Measurements in OCF :** Measurement of Velocity- Pitot Lube, Current Meter, Velocity Distribution, **B. Notches and Weirs:** Types, Derivation of Discharge Equation, Velocity of Approach, Francis Formula, Calibration of Notches, Errors in Measurement of Discharge, Sharp, Broad and Round Crested Weirs, Calibration of Weir, Time of Emptying Tank with Weir.	**5 Hrs.**

Recommended Textbooks:

1. Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi
2. Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi/Seth – Standard Book House, Delhi
3. Fluid Mechanics – K. L. Kumar – Eurasia Publication House, Delhi
4. Fluid Mechanics – Arora
5. Open Channel flow – Rangaraju – Tata McGraw-Hill Pub. Co., Delhi
6. Flow in open channel - K. Subramanyam – Tata McGraw-Hill Pub. Co., Delhi

References Books:

1. Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland
2. Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd. Tokyo
3. Fluid Mechanics – Shames - McGraw-Hill International Book Co., Auckland
4. Flow in open channel – V. T. Chaw - McGraw-Hill International Book Co., Auckland

Unit wise Measurable students Learning Outcomes:

After the completion of the unit the student should be able to

1. Understand the important fluid properties and application of hydrostatic law to determine the forces on plane and curved surfaces
2. Classify of flows and determine the rate of flow through tanks / pipes using discharge measurement devices
3. Determine the energy losses in pipe flow and solve two reservoir problems
4. Understand the types of flows, energy-depth relationship in OCF and design hydraulically most efficient channel sections
5. Analyze the GVF profiles and compute the energy loss in hydraulic jump and its efficiency as energy dissipating device
6. To determine the discharge in OCF using notches / weirs

Title of the Course:	**Engineering Survey**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0304**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basic Civil Engineering, Geometry and trigonometry.

Course Description:

The course mainly deals with the initial work in Construction of any work, Surveying. It involves in finding the Horizontal Positions and vertical positions of objects on the surface of the Earth.

Course Learning Objectives:

1. To recall basic principles, list types and define the practice of surveying.
2. To demonstrate use of conventional and modern survey equipments.
3. To collect field data and prepare calculation of areas and volumes.
4. To recall mathematics of trigonometry for indirect Surveying works.
5. To select appropriate tool and technique for engineering works.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Acquire basic principles of Survey, tabulate survey types	1	Cognitive
CO2	Demonstrate and carry out survey using both conventional and modern survey equipments	2	Psychomotor
CO3	Represent entries in the field book and compute Areas and volumes	2	Cognitive
CO4	Experiment and apply tools and techniques learned for Civil engineering works.	3	Cognitive

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	1	-	-	-	-	2	2	2	1	1	-	-
CO2	1	1	1	2	1	-	1	-	3	3	2	2
CO3	2	2	1	1	2	-	-	-	2	2	2	1
CO4	3	2	2	1	2	2	2	-	2	2	2	1

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Assignment/Declared test/Quiz / Seminar / Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit 1: Introduction a) Introduction –Basic Principle of Surveying, Errors in Surveying b) Classification of Survey-based on Instrument, Scale, purpose and place. c) Practice of Surveying	**2 Hrs.**
Unit 2: Levelling and Contouring a) Types of levels- components, working and use of dumpy, tilting, auto, digital and laser level. b) Types of leveling, objectives and applications c) Temporary Adjustments and Permanent Adjustments of levels. d) Corrections for curvature and refraction e) Contouring- Definition, characteristics contour interval, equivalent, uses and characteristics of contour lines, direct and indirect methods of contouring.	**9 Hrs.**
Unit 3: Areas and volumes a) Area- Trapezoidal, Simpson's rule, mechanical and digital planimeter b) Volume – Trapezoidal and Prismoidal rule for Earthwork c) Capacity calculation using contour map.	**5 Hrs.**

Unit 4: Plane Table Surveying a) Principles, accessories, significance and adjustments, Telescopic Alidade b) Methods and applications of plane table survey	**5 Hrs.**
Unit 5: Theodolite a) Theodolite- parts and technical terms, temporary and permanent adjustments of a transit Theodolite, Electronic Theodolite. b) Uses of theodolite- measurement of horizontal angle-direct angle, methods of repetition and reiteration, vertical angle, prolongation of a straight line, extending a line, measuring magnetic bearing of a line, Traversing. c) Trigonometrically leveling using theodolite-Problems on single-plane and double-plane methods	**9 Hrs.**
Unit 6: Engineering Applications a) Usage of minor instruments for different surveys b) Surveying for Road and Railway projects c) Surveying for Hydrographic survey d) Surveying for Tunnel survey	**5 Hrs.**

Recommended Textbooks:

1. N.N.Basak, Surveying and Leveling, Tata McGraw Hill Publications, 1st Edition.
2. B C Punmia, Surveying and Leveling, Vol I & II, Laxmi Publications.
3. Surveying Vol. I and II - S. K. Duggal, Tata McGraw Hill, New Delhi.

References Books:

1. Surveying for Engineers-John Uren & Bill Price—Palgrave Macmillan
2. Plane Surveying----A.M.Chandra---- New Age International Publishers
3. Surveying Vol. I ---- Dr.K. R. Arora
4. Surveying: Theory and Practice --- James M. Anderson, Edward M. Mikhail
5. Surveying theory and practices -- Devis R. E., Foot F. S.
6. Plane and Geodetic surveying for Engineers. Vol. I -- David Clark
7. Principles of Surveying. Vol. I by J.G.Olliver, J.Clendinning

Unit wise Measurable students Learning Outcomes:

1. Understand the basic principles of surveying and types of survey.
2. Understand types of levels, leveling, adjustments and Contour maps.
3. Calculate the area and volume for Earthwork.
4. Understand principles, methods and applications of Plane table surveying.
5. Understand the construction, adjustments and uses of theodolite.
6. Understand the use of surveying in different construction projects.

Title of the Course:	**Building Science and Services**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0305**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basic Civil Engineering, Engineering Graphics

Course Description:

Building science deals with fundamental study of human interaction with building as a system. Building services includes allied services like ventilation, plumbing, electrification etc.

Course Learning Objectives:

1. To study ergonomics and building physics
2. To examine building behavior with respect to climatic condition
3. To study role of each building components in RCC and steel buildings.
4. To study various building material and its properties related to building physics
5. To study building service requirements based on use of building.
6. To study standards prescribed by national building code

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Demonstrate knowledge of ergonomics and building physics	2	Demonstrate
CO2	Identify suitable building material and components for climate condition	3	Identify
CO3	Design appropriate building services based on use of building	6	Design
CO4	Apply provisions of national building code for building services.	6	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	-	-	1	-	1	3	-	-	-	-	2
CO2	-	2	3	2	-	1	2	-	-	-	-	1
CO3	2	-	3	1	3	2	1	1	1	-	-	-
CO4	2	1	1	-	-	-	-	1	-	-	-	1

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% weight age for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit 1: Introduction to Building Science Building site selection criteria, Building physics, thermal mass, thermal conductivity, sound insulation and ergonomics. Climate and building orientation based on sun path, comfort parameters. Types of building structures, Load bearing, Framed and composite.	**6 Hrs.**
Unit 2: Building Materials Following building materials with its use and physical, thermal properties to suit comfort conditions: building stone, aggregate fine and coarse, bricks and blocks, timber, steel and its types, concrete and mortar, flooring and dado, roofing and miscellaneous-aluminum, composite material, glass, plastic and admixtures.	**6 Hrs.**
Unit 3: Residential Building Components with planning Building Components and their basic requirements. Types of masonry. One , one and half brick thick wall. Partition wall Study of components with residential planning, principle and related bye laws(Bunglow,row houses). Introduction of low cost housing , rehabilitation and its construction a.	**8 Hrs.**

Unit 4: Building ventilation and electrification (as per national building code) Types of ventilations: passive and active systems, air change per hour. Air-conditioning, Principle, types, components. Types of electrification system, flow diagram from source to end user, Earthing.	**7 Hrs.**
Unit 5: Plumbing And Sanitation Services(as per national building code) Plumbing systems for fresh, hot and cold water. types of traps, fittings, chambers, septic tank and soak pit, concept of plumbing layout, Design of water tank and septic tank. Rain water harvesting (storage and ground water recharge), Introduction to fire fighting and fire hydrant system (Internal and External).	**8 Hrs.**
Unit 6: Building Finishes and Design Plastering, Pointing and its various techniques, types of wall claddings and its properties,(glazing and stone claddings), skirting, dado work, POP, gypsum plaster, fall ceilings, paints etc. Waterproofing treatment (sunks slabs, walls, balcony and terrace terrace) antitermite treatment. Staircase types and design (dog legged and quater turn)	**5 Hrs.**

Recommended Textbooks:

1. Building Drawing – Shah, Kale, Patki (Tata McGraw- Hill)
2. Building Design and Drawing – Y. S. Sane (Allied Book Stall, Pune)
3. Civil Engineering Drawing – M. Chakraborty.
4. Construction Technology (Volume 1 to 4) – R. Chudley (ELBS)
5. A to Z of Practical Building Construction and Its Management- Sandeep Mantri
6. (Satya Prakashan, New Delhi)
7. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)
8. Engineering Materials – R.K.Rajput (S. Chand)

References Books:

1. SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
2. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
3. Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy (P)ltd.

Unit wise Measurable students Learning Outcomes:

1. Student will able to study building science

2. Student will able to study building materials
3. Student will able to study building components.
4. Student will able to study plumbing services
5. Student will able to study services like Electrification, Fire Fighting and Ventilation.
6. Students will able study various building finishes.

Title of the Course:	**Solid Mechanics Lab**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0331**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Applied Mechanics, Engineering Mathematics

Course Description:

Solid Mechanics forms a core subject, taught to all students of the non-circuit disciplines of engineering. The study of this course is aimed at developing a thorough practical understanding of the basic material behaviour through simple experiments on different materials.

Course Learning Objectives:

1. To understand components of different equipments.
2. To study the behaviour of materials subjected to axial loading.
3. To study the behaviour of materials subjected to non-axial load effects such as shearing, bending and torsion.
4. To study important physical properties of materials such as water absorbtion, toughness, hardness.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Explain the components parts of the various equipments.	1	Cognitive
CO2	Examine the engineering properties of material as per IS experimental norms and provisions.	3	Cognitive
CO3	Classify material as adaptable or not for functional requirements.	4	Cognitive

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**
CO1	2	2	--	3	--	--	--	--	--	--	--	2
CO2	1	2	--	2	--	2	--	--	--	--	--	2
CO3	3	3	2	2	--	2	--	--	--	--	--	2

Assessments :

Teacher Assessment:

- Two components of Course Evaluation

Assessment	Marks
ISE	25
ESE OE	25

- ISE based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- ESE: Assessment is based on OE.

Course Contents:

A Attempt any Seven Experiments:

1. Study of Universal Testing Machine
2. Tensile test on Mild steel and Tor steel.
3. Compression test on M.S. and Cast Iron.
4. Compression test on timber.
5. Direct shear test on different metals.
6. Charpy or Izod Impact test on different metals.
7. Bending test on M.S. bar.
8. Water absorption and compression test on burnt bricks.
9. Hardness test on metals.
10. Torsion test Mild steel.

Recommended Textbooks:

1. Mechanics of Structure" (Vol. I and II) - Junnarkar S.B. and Advi, Charotar Publication.
2. Mechanics of Materials Vol I and II - Punmia, Jain, Laxmi Publications.
3. Strength of Materials - S Ramamrutham, DhanapatRai Publications.
4. Strength of Materials - Bhavikatti S.S., New Age Publications.
5. Strength of Materials - R.K.Rajput., S.Chand Publications.
6. Strength of Materials - R.K.Bansal., Laxmi Publications.
7. Structural Analysis - Bhavikatti S.S, Vikas Publications house New Dehli.
8. Strength of Material – Debabrata Nag, A. Chanda, 2nd Edition, Wiley India publication.

References Books:

1. "Strength of Material" - F. L. Singer and Pytel, Harper and Row publication.
2. "Introduction to Mechanics of Solids" - J.B. Popov, Prentice – Hall publication.
3. "Mechanics of Materials" - Gere and Timoshenko, CBS publishers.
4. "Mechanics of Materials" - R.C. Hibbler, Pearson Education.
5. "Mechanics of Material" - Beer and Johnston, M.

Experiment wise Measurable students Learning Outcomes:

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

1. List the different engineering properties and behavior of the materials.
2. Calculate the response of elastic bodies to pure axial loading.
3. Evaluate response (SFD and BMD) of determinate beams under different external loading.
4. Calculate the response of elastic bodies under pure bending.
5. Calculate the response of elastic bodies under pure shear.
6. Calculate the response of elastic bodies under torsion.

Title of the Course:	**Engineering Hydraulics Lab**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0332**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Knowledge of Fluid Mechanics and Basic Mathematics

Course Description:

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

Course Learning Objectives:

1. Operate fluid flow equipment and instrumentation.
2. Demonstrate principles discussed in Fluid Mechanics lecture course through experimentation
3. Develop skills for analyzing experimental data, designing and conducting experiments, and working in teams.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Read and follow directions for laboratory experiments.	(L-1)	Knowledge
CO2	Collect and analyze data using fluid mechanics principles and experimentation methods.	(L-4)	Analysis
CO3	Prepare reports following accepted writing and graphical techniques.	(L-5)	Synthesis
CO4	Perform exercises in small teams.	(L-2)	Comprehension

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**
CO1			2		1							
CO2			3			2						
CO3			3						1			
CO4									2			

Assessments :

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE POE	50

- ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- ESE POE: Assessment is based on Oral Examination

Course Contents:

Experiment No. 1: • **Aim and Objectives: Stability of Floating objects** • **Outcomes:** Determination of Metacentric Height for a ship model • **Theoretical Background:** Knowledge of Archimedes principle , Buoyancy and flotation • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**
Experiment No. 2: • **Aim and Objectives: Verification of Bernoulli's Theorem** • **Outcomes:** Determination the total energy of flow at different section in a test conduit • **Theoretical Background:** Understanding of concept of TEL and HGL • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**

Experiment No. 3: • **Aim and Objectives: Calibration of Orifice** • **Outcomes:** Determination of hydraulic Coefficients of orifice and their interrelationship • **Theoretical Background:** Bernoulli's equation application and Flow measurement through tank • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**
Experiment No. 4: • **Aim and Objectives: Calibration of Venturimeter/Orificemeter** • **Outcomes:** Determination of Coefficients of discharge , analytically and graphically • **Theoretical Background:** Bernoulli's equation application and Flow measurement through pipes • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**
Experiment No. 5: • **Aim and Objectives: Determination of Friction Factor for Given Pipe** • **Outcomes:** Computation of friction factor using Hazen- Poiselle equation • **Theoretical Background:** Laminar flow through pipe and Understanding the effect of pipe material and diameter on friction factor • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**

Experiment No. 6: • **Aim and Objectives: Determination of Minor Losses in a Given Pipe.** • **Outcomes:** Computation of minor losses due to change in cross sectional area and pipe fittings • **Theoretical Background:** Understanding of the effect of sudden change in diameter and presence of pipe fittings on the total energy of flow • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**
Experiment No. 7: • **Aim and Objectives: Study of Specific Energy Curve for Different Discharges** • **Outcomes:** Comparison between analytical and graphical value of critical depth • **Theoretical Background:** Knowing of Graphical representation of Energy-depth relationship • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**
Experiment No. 8: • **Aim and Objectives: Calibration of V-Notch / Rectangular Notch.** • **Outcomes:** Computation of coefficient of discharge for V-Notch / Rectangular Notch • **Theoretical Background:** Knowledge of Discharge measurement devices in OCF • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**

Experiment No. 9: • **Aim and Objectives: Study of Hydraulic Jump.** • **Outcomes:** Computation of H J elements viz. sequent depts. , power lost , length and height of jump • **Theoretical Background:** Theory of Rapidly Varid Flow • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**
Experiment No. 10: • **Aim and Objectives: Study of Flow over Weirs** • **Outcomes:** Computation of coefficient of discharge for rectangular / triangular weir • **Theoretical Background:** Knowledge of Discharge measurement devices in OCF • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**
Experiment No. 11:--- • **Aim and Objectives: Study of Moody's Chart** • **Outcomes:** Determination of friction factor for different combinations of Reynolds Number and relative roughness • **Theoretical Background:** Understanding of use of semilog graph paper • **Experimentation:** • **Results and Discussions:** • **Conclusion:**	**2 Hrs.**

Recommended Textbooks:

1. Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi
2. Fluid Mechanics – Hydraulic and Hydraulic Mechanics -Modi/Seth – Standard Book House, Delhi
3. Fluid Mechanics – K. L. Kumar – Eurasia Publication House, Delhi
4. Fluid Mechanics – Arora

References Books:

1. Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland
2. Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd. Tokyo
3. Fluid Mechanics – Shames - McGraw-Hill International Book Co., Auckland
4. Flow in open channel – V. T. Chaw - McGraw-Hill International Book Co., Auckland

Unit wise Measurable students Learning Outcomes:

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

1. Determination of Metacentric Height for a ship model
2. Determination the total energy of flow at different section in a test conduit
3. Determination of hydraulic Coefficients of orifice and their interrelationship
4. Determination of Coefficients of discharge , analytically and graphically
5. Computation of friction factor using Hazen- Poiselle equation
6. Computation of minor losses due to change in cross sectional area and pipe fittings
7. Comparison between analytical and graphical value of critical depth
8. Computation of coefficient of discharge for V-Notch / Rectangular Notch
9. Computation of H J elements viz. sequent depts. , power lost , length and height of jump
10. Computation of coefficient of discharge for rectangular / triangular weir
11. Determination of friction factor for different combinations of Reynolds Number and relative roughness

Title of the Course:	**Engineering Survey Lab**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0333**	**-**	**-**	**4**	**2**

Course Pre-Requisite:

Basic Civil Engineering and Engineering Survey Theory

Course Description:

The course mainly deals with Experiments, field work, methods and instruments for the Surveying work of finding the Horizontal Positions and vertical positions of objects on the surface of the Earth.

Course Learning Objectives:

1. To understand basic principles of surveying.
2. To use conventional and modern survey equipments.
3. To analyze the field data.
4. To calculate area and volume from field data.
5. To apply in civil engineering project works at Primary Level.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Tabulate various measurements in the field book	1	Cognitive
CO2	Determine linear and angular measurements	2	Cognitive
CO3	Measure areas of irregular figures	3	Affective
CO4	Carry out plans and sections required for civil engineering projects	5	Psychomotor

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	1	1	2	-	1	2	2		2	3	-
CO2	2	2	-	1	2	-	-	-		2	3	-
CO3	2	2	1	1	-	2	-	-		2	3	-
CO4	2	3	-	1	-	-	-	-		2	3	-

Assessments :

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks	
ISE1 (Experiments)	10	25
ISE2-PBL	15	
ESE POE	50	

- ISE1 are based on practical performed/Group Discussion/ Internal oral etc.
- PBL (ISE2) is a mini-Project based on problem statement.
- ESE POE: Assessment is based on External Practical & Oral Examination

Course Contents:

Practical Work:

1. Study of dumpy level, titling level, Auto level, digital level and laser level differential levelling
2. Balancing of Sight and Reciprocal levelling
3. Plane table survey-Radiation, Intersection and Resection
4. Measurement of Area by Mechanical and Digital planimeter
5. Vernier theodolite- horizontal angles and vertical angles
6. Trigonometrically levelling – Single plane and double by theodolite
7. Electronic Theodolite- Measurement of angles

Study of Topo sheets and Identification of features from Topo-sheets

Survey Project Work:

1. Block contouring using level project for at least 100m x 100m
   - Report on Various Topographic Features seen from Contour Maps.
2. Road Project- (Min. 500 m length)
   - Longitudinal Section of road.
   - Cross-section of road.
   - Computation of Earthwork using computer application.

Recommended Textbooks:

1. N.N.Basak, Surveying and Leveling, Tata McGraw Hill Publications, 1st Edition.
2. B C Punmia, Surveying and Leveling, Vol I & II, Laxmi Publications.
3. Surveying Vol. I and II - S. K. Duggal, Tata McGraw Hill, New Delhi.

References Books:

1. Surveying for Engineers-John Uren & Bill Price—Palgrave Macmillan
2. Plane Surveying----A.M.Chandra---- New Age International Publishers
3. Surveying Vol. I ---- Dr.K. R. Arora
4. Surveying: Theory and Practice --- James M. Anderson, Edward M. Mikhail
5. Surveying theory and practices -- Devis R. E., Foot F. S.
6. Plane and Geodetic surveying for Engineers. Vol. I -- David Clark
   Principles of Surveying. Vol. I by J.G.Olliver, J.Clendinning

Unit wise Measurable students Learning Outcomes:

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

1. Understand the basic principles of surveying and types of survey.
2. Understand types of levels, leveling, adjustments and Contour maps.
3. Calculate the area and volume for Earthwork
4. Understand principles, methods and applications of Plane table surveying.
5. Understand the construction, adjustments and uses of theodolite.
6. Understand the use of surveying in different construction projects.

Project Based Learning (PBL) under Engineering Survey Lab	
Title of the Course:	**Engineering Survey Lab**
Course Code:	**UCVL0333**

1. Problem Statement:

It is required to estimate and provide information regarding the Earthwork for proposed road leading from the Campus to a new destination.

2. Abstract/Description of Problem Statement :

The problem requires using field work, methods and instruments of Surveying and using knowledge learnt in theory course for applying in field and finding solution to the problem.

The college Estate office and Civil engineering Department experts have asked for a proposal to undertake earthwork for construction of a road.

The Survey work using various instruments has to be carried out in a time bound manner and filed book has to be filled up systematically.

The drawings in the form of L-section, Cross-section and contours are to prepared.

Computation of earthwork volume has to be carried out and best alternative route has to be suggested.

3. Activities/Steps with duration to solve the problem:

Activity	Duration (Max)
➢ Milestone 1 • Introduction to PBL • Activities involved for problem statement with constraints • Explanation of rubrics	1 week
➢ Milestone 2 • Field work of Levelling work using different levels. • Field book recording	3 week
➢ Milestone 3 • Preparing plan & L-section of road and fixing formation Level on drawing sheet	2 week
➢ Milestone 4 • Preparing cross-section of road and fixing slope for cutting and embankment on drawing sheet	2 week

➢ Milestone 5 • Computations for Earthwork using volume formulae using software	2 week
➢ Milestone 6 • Presentation of their work	2 week
Total	**12 Week**

4. Assessment Scheme:

Assessment (ISE2)	Marks (15)
Field work & Drawing work	8
Computations, Presentation ,Q & A	7

5. Evaluation Scheme:

Evaluation	Marks
Field work	03
Drawing work L-section sheet & Cross-section sheet	05
Computations for Earthwork	02
Presentation skills & Question & Answers	05
Total	15

Title of the Course:	**Building Science and Services Lab**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0334**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Building science and services, Basic Civil Engineering

Course Description:

Students will be draw building components with respect to material identification from drawings as well as solve assignments based on building science and building materials

Course Learning Objectives:

1. To draw and acquire knowledge of human body dimensions from building use perspective.
2. To draw Sun path and its location with respect to time scale during an year.
3. To draw building and construction components
4. To acquire knowledge and drawing capability of building services such as electrification, Plumbing.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Demonstrate knowledge of ergonomics and building physics	2	Demonstrate
CO2	Identify suitable building material and components for climate condition	3	Identify
CO3	Design appropriate building services based on use of building	6	Design
CO4	Apply provisions of national building code for building services.	6	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	-	-	1	-	1	3	-	-	-	-	2
CO2	-	2	3	2	-	1	2	-	-	-	-	1
CO3	2	-	3	1	3	2	1	1	1	-	-	-
CO4	2	1	1	-	-	-	-	1	-	-	-	1

Assessments :

Teacher Assessment:

Assessment	Marks
ISE	50

- ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- ESE POE: Assessment is based on Oral Examination

Course Contents:

Draw on Drawing Sheets:

1. Types of drawing and plans.
2. Drawing on human energy interaction with building and environment
3. Sun path diagrams
4. Body dimension and ergonomics sheet
5. Submission drawing for residential building.
6. Detail working drawing of foundation and center line plan of residential building.
7. Drawing on electrification system of residential building.
8. Drawing on plumbing system of residential building.
9. Detail working drawing of door, window, staircase, lift and ramp of residential building.

Assignment Work:

1. Assignments on each unit.

Recommended Textbooks:

1. Building Drawing – Shah, Kale, Patki (Tata McGraw- Hill)
2. Building Design and Drawing – Y. S. Sane (Allied Book Stall, Pune)
3. Civil Engineering Drawing – M. Chakraborty.
4. Construction Technology (Volume 1 to 4) – R. Chudley (ELBS)
5. A to Z of Practical Building Construction and Its Management- Sandeep Mantri
6. (Satya Prakashan, New Delhi)
7. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)
8. Engineering Materials – R.K.Rajput (S. Chand)

References Books:

1. SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
2. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
3. Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy (P)ltd

Title of the Course:	**Environmental Studies**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0361**	**2**	**-**	**-**	**-**

Assessments :

Teacher Assessment: Not Applicable

Course Contents:

Unit 1: Nature of Environmental Studies: Definition, scope and importance. Multidisciplinary nature of environmental studies. Need for public awareness.	**4 Hrs.**
Unit 2: Natural Resources and Associated Problems: a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Food resources: World food problem, changes caused by effect of modern agriculture, fertilizer-pesticide problems. e) Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. f) Land resources: Solar energy , Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification. g) Role of individuals in conservation of natural resources.	**4 Hrs.**
Unit 3: Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following ecosystem :- a. Forest ecosystem, b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).	**6 Hrs.**
Unit 4: Introduction- Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical,	**6 Hrs.**

aesthetic and option values. India as a mega- diversity nation. Ghat as a biodiversity region. Hot-spot of biodiversity. Threats to biodiversity habitat loss, poaching of wildlife, man- wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	
Unit 5: Environmental Pollution: Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of a individual in prevention of pollution	**6 Hrs.**
Unit 6: Social Issues and the Environment: Disaster management: floods, earthquake, cyclone, tsunami and landslides. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions. Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products.	**8 Hrs.**
Unit 7: Environmental Protection: From Unsustainable to Sustainable development. Environmental Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Population Growth and Human Health, Human Rights.	**8hrs**
Unit 8: Field Work: Visit to a local area to document 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, river, hill slopes, etc.	**10 hrs**

Recommended Textbooks:

1. Agarwal, K.C.2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India, Email:mapin@icenet.net (R)
3. Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
4. Clank R.S. Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p
6. De A.K., Environmental Chemistry, Wiley Wastern Ltd.
7. Down to Earth , Centre for Science and Environment , New Delhi.(R)
8. Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H.& Watson, R.T.1995, Global Biodiversity Assessment, Cmbridge Univ. Press 1140p.
11. Jadhav, H.and Bhosale, V.M.1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
12. Mickinney, M.L.and School. R.M.1196, Environmental Science Systems and Solutions, Web enhanced edition, 639p.
13. Miller T.G. Jr., Environmental Science. Wadsworth Publications Co.(TB).
14. Odum, E.P.1971, Fundamentals of Ecology, W.B.Saunders Co. USA, 574p.
15. Rao M.N.and Datta, A.K.1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd., 345p
16. Sharma B.K., 2001, Environmental Chemistry, Gokel Publ. Hkouse, Meerut
17. Survey of the Environment, The Hindu (M)
18. Townsend C., Harper, J. and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
19. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. I and II, Environmental Media (R)
20. Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno-Science Publications (TB)
21. Wagner K.D.,1998, Environmental management, W.B. Saunders Co. Philadelphia, USA 499p.
22. Paryavaran shastra – Gholap T.N.
23. Paryavaran Sahastra - Gharapure

(M) Magazine
(R) Reference
(TB) Textbook

Teaching and Evaluation scheme for
Second Year B.Tech Program in Civil Engineering Semester – IV

Sr. No	Curriculum Component	Course Code	Course	Teaching Scheme				Evaluation Scheme			
				L	T	P	Credit	Component	Marks		
									Max	Min for Passing	
1	PC	UCVL 0401	Structural Analysis	3	1	0	4	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
2	PC	UCVL 0402	Concrete Technology	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
3	PC	UCVL 0403	Environment Engineering -I	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
4	PC	UCVL 0404	Advance Surveying	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
5	PC	UCVL 0405	Hydrology & Water Resources Engineering	3	1	0	4	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
6	PC	UCVL 0431	Concrete Technology Lab	0	0	2	1	ISE	25	10	
								ESE OE	25	10	
7	PC	UCVL 0432	Environment Engineering -I Lab	0	0	2	1	ISE	50	20	
								ESE POE	50	20	
8	PC	UCVL 0433	Computer Aided Drawing LAB	0	0	4	2	ISE	25	10	
								ESE POE	50	20	
9	PC	UCVL 0434	Advance Surveying	0	0	2	1	ISE	25	10	
10		UCVL 0461	Building Planning and Design (Audit Course)	3	0	0	0		100	40	
			Total	**18**	**2**	**10**	**22**	**Total Contact Hrs**			**30**

Title of the Course:	**Structural Mechanics**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0401**	**3**	**1**	**-**	**4**

Course Pre-Requisite:

Applied Mechanics, Engineering Mathematics, Solid Mechanics

Course Description:

Structural Mechanics forms a core subject which is taught to students of all non-circuit disciplines of engineering. The study of this subject is aimed at developing the ability to interpret the response of structural elements towards combined straining effects in terms of static and kinematic aspect.

Course Learning Objectives:

1. To evaluate combined effect of direct and bending stresses.
2. To determine principal stresses and strains.
3. To determine buckling load on columns.
4. To determine slope and deflection of beams.
5. To draw ILD for beams and Truss.
6. To evaluate deflections of beams.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Extend the basic responses towards combined effect of loads.	2	Cognitive
CO2	Analyse the stresses due to combination of load effects on structures / sections	4	Cognitive
CO3	Analyse simple structures for deformation studies by conventional and / or energy concepts.	4	Cognitive
CO4	Evaluate the influence line curves for typical determinate structures.	5	Cognitive

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	3	3	--	--	--	--	--	--	--	--	2
CO2	2	3	2	--	2	--	--	--	--	--	--	2
CO3	2	3	2	--	2	--	--	--	--	--	--	2
CO4	2	3	2-	--	--	--	--	--	--	--	--	2

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit 1: Combined direct and bending stresses Combined direct and bending stresses, columns subjected to eccentric loading, chimney, Earth retaining wall, Masonry Dam, stability of masonry dam.	**8 Hrs.**
Unit 2: **A Principal planes and stresses** Principal planes and stress in two dimensions, Analytical and Mohr's circle method. Principal stress in beams. **B** Combined bending, torsion and axial thrust effects on Solid and Hollow Shafts. Concept of Equivalent moment and equivalent torque.	**7 Hrs.**
Unit 3: **Analysis of long columns:** Definition of column and strut, End conditions of columns, Analysis of long columns, Euler's theory and Rankine's theory. **Three hinged parabolic arch:** Parabolic arches with supports at same level.	**7 Hrs.**
Unit 4: Slope and deflection of determinate beams : Slope and deflection of determinate beams - Double integration method, Macaulay's method, moment-area method and conjugate beam method, three hinged parabolic arches.	**8 Hrs.**

Unit 5: Influence line diagrams: Influence line diagrams for determinate beams, compound beams, through type bridge trusses and deck type bridge trusses.	**7 Hrs.**
Unit 6: Energy Theorems : Castiglione's theorem, Betti's law, Maxwell's reciprocal theorem. Deformations of determinate beams, bents and portal frames by unit load method.	**5 Hrs.**

Recommended Textbooks:

1. Mechanics of Structure (Vol. I and II) - Junnarkar S.B. and Dr.H.J.Shaha, Charotar Publication.
2. Mechanics of Materials Vol I and II - Punmia, Jain, Laxmi Publications.
3. Strength of Materials - S Ramamrutham, DhanapatRai Publications.
4. Strength of Materials - Bhavikatti S.S., New Age Publications.
5. Strength of Materials - R.K.Rajput., S.Chand Publications.
6. Strength of Materials - R.K.Bansal., Laxmi Publications.
7. Structural Analysis - Bhavikatti S.S, Vikas Publications house New Dehli.
8. Strength of Material – Debabrata Nag, A. Chanda, 2nd Edition, Wiley India publication.

References Books:

1. Strength of Material - F. L. Singer and Pytel, Harper and Row publication.
2. Introduction to Mechanics of Solids - J.B. Popov, Prentice – Hall publication.
3. Mechanics of Materials - Gere and Timoshenko, CBS publishers.
4. Mechanics of Materials - R.C. Hibbler, Pearson Education.
5. Mechanics of Material - Beer and Johnston, M.

Unit wise Measurable students Learning Outcomes:

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

1. To calculate combined effect of direct and bending stresses.
2. To calculate principal stresses and strains.
3. To study loading effects on typical structural elements.
4. To calculate slope and deflection of beams.
5. To plot ILD for simple structures.
6. To calculate deflections of simple structures.

Title of the Course:	**Concrete Technology**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0402**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basic Civil Engineering

Course Description: Fluid mechanics

Concrete Technology forms a core subject which is taught to students of all non-circuit disciplines of engineering. The study of this subject is aimed at developing a thorough understanding of the Concrete material behavior & its applications to solve engineering problems.

Course Learning Objectives:

1. To explain the important engineering properties of Concrete materials.
2. To explain the behavior of Fresh and harden concrete.
3. To explain the behavior of special concrete
4. To explain the Concrete mix design.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Identify the functional role of ingredients of concrete and apply fundamental knowledge in the fresh and hardened properties of concrete.	3	Identify/ Apply
CO2	Evaluate the effect on concrete by its service life performance, properties and failure modes of structural concrete and demonstrate techniques of measuring the Non Destructive Testing of concrete structure	5	Evaluate
CO3	Develop an awareness of the utilization of different materials as novel innovative materials for use in special concrete	6	Develop
CO4	Design the concrete mix which fulfills the required properties for fresh and hardened concrete	6	Demonstrate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	--	2	--	2	2	--	--	--	1	--	--	2
CO2	2	2	3	--	3	--	--	--	1	2	--	--
CO3	--	2	--	2	3	--	--	--	2	3	--	2
CO4	--	2	--	--	3	--	2	--	2	2	--	--

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit 1: **5 Hrs.**

Concrete materials

Cement - Ordinary Portland, Portland Pozzolana, chemical composition, grade of cement, hydration, tests for cement, fineness, soundness, compressive strength, setting time

Aggregates - Classification, requirements, size, shape, texture, Tests for coarse aggregates: specific gravity, grading of aggregate, Flakiness index, Elongation Index, Impact value, abrasion value, crushing value, alkali aggregate reaction. Tests for fine aggregates: specific gravity, sieve analysis, fineness modulus, bulking of sand,

Water - General requirements, quality of water

Unit 2: **Fresh Concrete:** Workability, factors affecting, measurement of workability, different tests for workability, segregation, bleeding, process of manufacture of concrete -batching, mixing, transportation, compaction, curing of concrete, curing methods, **Admixtures in concrete** - air entraining agents, plasticizer and super plasticizer, accelerators, retarders, workability agents. Mineral admixtures: fly ash, silica flumes, Ground Glass Blast Furnace Slag, Metakoline.	**8 Hrs.**
Unit 3: **Hardened Concrete -** Strength of concrete, w/c ratio, gel/space ratio, gain of strength with age, maturity concept of concrete, effect of maximum size of aggregate on strength, relation between compressive and tensile strength, factors affecting modulus of elasticity, definition and factors affecting creep and shrinkage.	**6 Hrs.**
Unit 4: **Durability of concrete -** Strength and durability relationship, effect of w/c on durability, different exposure condition as per IS 456 minimum and maximum cement content, effect of permeability, sulphate attack, methods of controlling sulphate attack. Durability of concrete in sea water, Test on hardened concrete - flexural strength, comparison of cube test and cylinder test, Schmidt's rebound hammer, Ultrasonic pulse velocity method.	**8 Hrs.**
Unit 5: **Special Concrete -** Light weight concrete, no-fines concrete, high density concrete, fiber reinforced concrete, self-compacting concrete, high strength concrete, high performance concrete, manufacturing of ready mix concrete, cold weather concreting, hot weather concreting, pavement quality concrete, Green concrete, Testing of special concrete for various properties.	**5 Hrs.**
Unit 6: **Concrete Mix Design -** Objectives of mix design, different methods of mix design, factors affecting mix proportions, quality control of concrete, statistical methods, acceptance criteria, Numerical on mix design by ACI 211.1-91, IS 10262- 2009andIS 456. Mix design of fly ash concrete by IS 10262 – 2009. Introduction of design mix for high performance concrete.	**8 Hrs.**

Recommended Textbooks:

1. Naville, A.M., Concrete Technology, Pearson Education.
2. Santakumar, A.R., Concrete Technology, Oxford University Press.
3. Shetty, M.S., Concrete Technology, S. Chand Publication.
4. Gambhir, M.L., Concrete Technology, Tata McGraw Hill.

IS codes:

1. IS: 10262,2009, Recommended guidelines for Concrete Mix Design
2. IS: 456, 2000, Indian Standard Plain and Reinforced Concrete

References Books:

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

Unit wise Measurable students Learning Outcomes:

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

1. Evaluate the properties of Concrete materials.
2. Evaluate the properties of Fresh concrete
3. Evaluate the properties of Harden concrete
4. Factors of durability of concrete
5. Aware of special concrete.
6. Calculate mix design of concrete

Title of the Course:	**Environmental Engineering - I**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0403**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Students must have basic idea about Environmental Problems and issues regarding the application of knowledge of the concepts which are essential for understanding correlation of Engineering and Environmental Issues like water pollution and disposal problems.

Course Description:

This course will help the students to understand the importance and seriousness about pollution of Water and water treatment facilities and Civil Engineering aspects like Green buildings and water supply network.

Course Learning Objectives:

1. Assess the quality and carry out quantification of the given source of water for drinking purpose as per standards of I.S.10500.
2. Sequencing and design the water treatment units for various qualities of water depending on water source as per mentioned design parameters.
3. Analyze the water distribution system numerically and computationally with respect to water quality, water pressure and pipe quality.
4. Acquire the basic information of Green building and distinguish between conventional and green building.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Assess the quality and carry out quantification of the given source of water for drinking purpose as per standards of I.S.10500.	2	Cognitive
CO2	Sequencing and design the water treatment units for various qualities of water depending on water source as per mentioned design parameters.	4	Cognitive
CO3	Analyze the water distribution system numerically and computationally with respect to water quality, water pressure and pipe quality.	5	Cognitive
CO4	Acquire the basic information of Green building and distinguish between conventional and green building.	4	Cognitive

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	1	3	--	1	--	3	--	--	--	--	1
CO2	3	2	2	3	1	3	3	1	--	--	--	1
CO3	3	2	2	2	1	3	3	1	--	--	--	1
CO4	1	--	2	1	--	--	3	1	--	--	--	1

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit 1: **Water:** Sources of water, quantity & quality of sources, demand of water, factors affecting demand, fluctuations in demand, rate of water consumption, design period & population forecast. **Water quality parameters**: Characteristics & significance in water treatment, drinking water quality standards- BIS, WHO. **Intake Works** : Concepts of Intake well, Jack well and Rising main. Design of Intake well.	**5 Hrs.**

Unit 2: Concept of water treatment process **Aeration-** Types of aerators, design of cascade aerator **Coagulation & Flocculation:** Theory of coagulation and flocculation, destabilization of colloidal particles, factors affecting coagulation, types of coagulants, methods of dosing of coagulants, Jar tests, design of rapid mixer & flocculator. **Sedimentation-** Theory, types of settling, types of sedimentation tanks. Design of vertical flow **Sedimentation** tank. Concept and design of clariflocculator. Concept of tube & plate settler.	**9 Hrs.**
Unit 3: **Filtration-** Mechanism, head loss development, negative head loss. **Types of filters**- Slow sand, Rapid sand, Multimedia & Pressure filters. Operation & design of rapid sand filter. **Disinfection-** Mechanism, factors affecting disinfection, methods of disinfection, chemistry of chlorination, Forms of chlorination and practices. **Water softening processes -** lime-soda process, ion exchange **Demineralization -** Reverse osmosis, electrodialysis. Layout of water treatment units as per source.	**6 Hrs.**
Unit 4: **Reservoirs:** necessity and types. **Transmission of water**: pumping & gravity mains, choice of pipe materials, forces acting on pressure pipes, design of thrust block, corrosion types & control measures. **Leakage & pressure testing of pipes.**	**4 Hrs.**
Unit 5: **Water Distribution System:** basic requirements, methods of distribution, layout patterns, methods of network analysis: Equivalent pipe, Hardy-Cross method, design problems. Water appurtenances Use of open source software- EPANET in network analysis.	**9 Hrs.**
Unit 6: **Green building**: Concept and materials, Energy and water budgeting and plumbing.	**3 Hrs.**

Recommended Textbooks:

1. Water and Waste water Technology by Mark J. Hammer,John Wiely and Sons.
2. Introduction to Environmental Engineering by M. L. Davis and Davis A. Cornwell, Mc Graw Hill.
3. Environmental Engineering: A design approach by A.P. Sincero and G.A. Sincero. Prentice Hall of India.
4. Environmental Engineering by H.S. Peavy, D.R. Rowe. McGraw Hill
5. Water Supply Engineering by Dr. P. N. Modi, Standard Book House, New Delhi.
6. Water Supply Engineering by S. K. Garg, Khanna Publishers, New Delhi
7. Water Supply Engineering by Dr. B. C. Punmia, Laxmi Publishers, New Delhi

References Books:

1. Manual of water supply and treatment by Government of India publication.

Unit wise Measurable students Learning Outcomes:

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

1. Understand the water quality parameters and acceptance standards.
2. Study and design the aeration, coagulation flocculation and sedimentation.
3. Able to design the filtration process.
4. Understand transmission and leakages in pipes,
5. Analyze the water distribution system and make use of software.
6. Understand the details of green buildings.

Title of the Course:	**Advanced Surveying**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0404**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Engineering Surveying

Course Description:

The course mainly deals with survey of large areas, also called geodetic survey where curvature of earth is taken into consideration. Indirect methods of surveying and trigonometry are studied. This course also has a focus on design and setting out Curves for road and railway. Modern tool of surveying are introduced in this course.

Course Learning Objectives:

1. To learn indirect and speedy method for distance and elevation calculations.
2. To practice methods for Curve Setting in engineering Survey of roads, railways.
3. To explain surveying of larger Area by method of triangulation, i.e. geodetic Surveying.
4. To perceive higher methods of surveying using contemporary Techniques.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Classify indirect Surveying by tacheometric systems and use trigonometric functions for distance and elevation calculation	3	Cognitive
CO2	Use and apply principle of triangulation for large Areas as in geodetic surveying	3	Cognitive
CO3	Relate data collected from Aerial surveying, GNSS survey in GIS platforms	3	Cognitive
CO4	Classify and combine various methods for Curve setting for roads and railways.	5	Cognitive

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	3	1	-	1	-	-	-	2	2	-	1
CO2	3	1	1	2	-	1	-	-	1	-	1	1
CO3	-	1	2	2	3	-	1	-	1	1	1	1
CO4	3	3	1	-	1	1	-	-	2	2	1	2

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit 1: Theodolite Traversing a) Objectives, traverse table, plotting, Area Calculation of Traverse b) Different methods of theodolite traverse, Gales' traverse table, balancing of traverse by transit rule and Bowditch's rule, c) Omitted measurements d) Open traverse and its uses, deflection angles, open traverse survey, checks in open traverse.	**7 Hrs.**
Unit 2: Tacheometry a) Principles, suitability, methods of Tacheometry to determine horizontal distances and elevations of points. b) Contouring by Tacheometry c) Electronic distance measurements – principle, evolution and use of EDMs and Total station.	**7 Hrs.**
Unit 3: Curves a) Significance of curves and curve setting b) Type of horizontal curve, elements of simple, compound, transition and combined curve, setting out of simple curve by linear and angular methods. c) Vertical curves – types, lengths of vertical curves	**7 Hrs.**

Unit 4: Geodetic Surveying a) Triangulation, Principle, Classification system, Selection of station, Base line Measurement. b) Signals and towers, phase correction, satellite station, reduction to center, spherical excess, angular observations c) Trilateration	**6 Hrs.**
Unit 5: Aerial Photogrammetry – a) Types of photogrammetry and photographs. b) Aerial photogrammetry – scale of vertical photographs, flight planning and mosaic c) Use of UAV- drones in aerial mapping d) Stereoscopy and interpretations	**4 Hrs.**
Unit 6: RS,GIS and GNSS a) Remote sensing – Definition, relevance, types, electromagnetic radiation and spectrum, energy sources and its characteristics, image acquisition , applications to civil engineering b) GIS – Terminology, advantages, basic components of GIS, data types, applications of GIS. c) GNSS – basic principles, GPS segments, receivers, applications in survey. Types of GNSS systems.	**5 Hrs.**

Recommended Textbooks:

1. Surveying Vol. I and II - S. K. Duggal, Tata McGraw Hill, New Delhi.
2. B C Punmia, Surveying and Leveling, Vol I & II, Laxmi Publications.
3. N.N. Basak, Surveying and Leveling, Tata McGraw Hill Publications, 1st Edition

References Books:

1. Surveying for Engineers-John Uren & Bill Price—Palgrave Macmillan
2. Plane Surveying----A.M. Chandra---- New Age International Publishers
3. Surveying Vol. I & II ---- Dr.K. R. Arora
4. Surveying: Theory and Practice --- James M. Anderson, Edward M. Mikhail
5. Surveying theory and practices -- Devis R. E., Foot F. S.
6. Plane and Geodetic surveying for Engineers. Vol. I -- David Clark

Unit wise Measurable students Learning Outcomes:

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

1. Understand Theodolite traversing and calculate omitted measurements.
2. Understand Tacheometry and EDM.
3. Understand and Design different types of Curves
4. Understand Geodetic surveying.
5. Understand Aerial Photogrammetry and Aerial photograph interpretations.
6. Understand definition, terminologies, principles and uses of RS,GIS and GNSS

Title of the Course:	**Hydrology and Water Resources Engineering**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0405**	**3**	**1**	**-**	**4**

Course Pre-Requisite:

Fluid Mechanics, Hydrology

Course Description: Fluid mechanics

The course mainly deals with different hydrologic processes, their impact on environment, principles and practical application.

Course Learning Objectives:

1. To impart the basic knowledge of importance of Hydrology & irrigation in water resources Development
2. To know various hydro meteorological parameters and their estimation
3. To create awareness about floods, their estimation using various methods
4. To understand the importance of irrigation in Indian agricultural industry considering cropping patterns
5. To understand the principles of watershed management and water harvesting

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Carry out the survey that extends knowledge in water resources engineering.	1	Carry
CO2	Demonstrate in-depth knowledge of water resources engineering	2	Demonstrate
CO3	Analyze and Apply the knowledge to water resource issues at multiple scales.	4	Analyze
CO4	Create and assess the quantitative relationship that explains the understanding of hydrological processes in answering scientific and water-resources-management questions.	6	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	-	-	1	-	2	-	-	-	-	-	-
CO2	-	-	3	2	3	-	-	-	-	-	-	-
CO3	-	3	2	-	2	2	-	-	-	-	-	-
CO4	-	2	2	1	2	-	-	-	-	-	1	-

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit 1: a) **Introduction of Hydrology:** Definition, Importance and scope of hydrology, the hydrologic cycle, b) **Precipitation:** Forms and types of precipitation, Methods of measurement, Graphical representation of rainfall - Mass rainfall curves, Hyetograph, Determination of average precipitation over the catchment. c) **Evaporation:** Proccess, factors affecting, measurement, and control of evaporation, Estimation of evapo-transpiration by blaney-criddle method and penman method, d) **Infiltration:** Process, Factors affecting and measurement of Infiltration	**8 Hrs.**
Unit 2: a) **Runoff:** Factors affecting runoff, Determination of annual runoff, Rainfall runoff relationship, SCS curve method. b) **Hydrograph:** Storm hydrograph, Base flow and Separation of base flow, direct runoff hydrograph, Unit hydrograph – theory – assumptions and limitations, Derivation and use of unit hydrograph, S-curve hydrograph.	**6 Hrs.**
Unit 3: a) **Stream Gauging**: Selection of site, discharge measurement by Area velocity method, slope Area method	**6 Hrs.**

b) **Floods:** Estimation of peak flow-- empirical equations, rational method, Importance of –Design flood, standard project flood, maximum probable flood, Introduction to flood frequency analysis.	
Unit 4: a) **Ground water hydrology:** Occurrence, distribution and classification of ground water, Darcy's law, Acquifer parameters— Permeability, specific yield, specific retention, porosity, storage coefficient, Transmissibility, Hydraulics of well under steady flow conditions in confined and unconfined aquifers, Specific capacity of well, Recuperation Test, constructional features of Tube wells and Open wells .	**6 Hrs.**
Unit 5: a) **Introduction to irrigation**: Definition and necessity of irrigation, ill-effects of irrigation, surface, sub-surface, sprinkler irrigation, Water logging and land drainage. b) **Water requirement of crops:** Principal crops and crop seasons, cropping pattern and crop rotation, Classes and availability of soil water, depth and frequency of irrigation, Duty, delta, base period and their relationship, factors affecting duty, methods of improving duty, Assessment and efficiency of irrigation water. Gross command area, culturable command area and command area calculations based on crop water requirement	**8 Hrs.**
Unit 6: a) **Minor Irrigation works:** General layout, main components and functioning of –1. Percolation tanks, 2. K.T.Weir, 3. Bandhara irrigation 4. Lift irrigation. b) **Watershed Management:** Need and importance of watershed management, Soil conservation measures, Techniques of Rainwater and groundwater harvesting. Conjunctive use and management of surface water and ground water.	**6 Hrs.**

Recommended Textbooks:

1. Irrigation Engineering – S. K. Garg – Khanna Publishers, Delhi.
2. Irrigation, Water Resources and Water power Engineering – Dr P.N. Modi
3. Irrigation and Water power Engineering – Dr Punmia and Dr.Pande – Laxmi Publications,Delhi
4. Engineering Hydrology – Dr. K. Subramanya., -Tata McGraw Hill, New Delhi.
5. Hydrology – Dr. P Jayarami Reddy, Laxmi Publications, New Delhi
6. Engineering Hydrology – Dr.Raghunath H.M. - New Age International Publishers.
7. Watershed Management in India – J.V.S.Murthy – Wiley Eastern Publications, Delhi.
8. Irrigation Engineering – Dahigaonkar Asian Book Pvt Ltd
9. Irrigation Engineering, Raghunath, WILEY,

References Books:

1. R.K.Sharma, 'Hydrology and water resources', Dhanpatrai and sons, New Delhi.
2. Varshney, Gupta and Gupta, 'Theory and design of irrigation structures vol. I and II and III, Newchand and Brothers.
3. Michael, 'Irrigation Theory and practice', Vikas Publications House.
4. Jaspal Sing, M.S.Acharya, Arun Sharma, 'Water management', Himanshu Publications.
5. Design of M.I. and Canal Structure – Satyanarayan and R. Murthy.
6. Water and Soil Conservation – Ghanshyam Das

Unit wise Measurable students Learning Outcomes:

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

1. To introduce the students the basics of water balance and hydrological cycle of an earth
2. To make the students to be able to do hydrograph analysis and to know its application in practice
3. To introduce the students groundwater hydrology and groundwater computation.
4. To expose the students to different sites of rainwater harvesting and minor irrigation works by having different site visits
5. To introduce the students different terms related with irrigation requirements for diff. crops and basics of computations of crop water requirements
6. To expose the students to different sites of irrigation engineering through site visits.

Title of the Course:	**Concrete Technology Lab**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0431**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Basic Civil Engineering

Course Description:

Concrete Technology forms a core subject which is taught to students of all non-circuit disciplines of engineering. The study of this subject is aimed at developing a thorough understanding of the Concrete material behavior & its applications to solve engineering problems.

Course Learning Objectives:

1. To explain the important engineering properties of Concrete materials.
2. To explain the behavior of Fresh and harden concrete.
3. To explain the Concrete mix design.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Identify the properties of different cement, aggregates fresh concrete.	3	Identify
CO2	Evaluate the effect on hardened concrete by using destructive Non Destructive Testing	5	Evaluate
CO3	Demonstrate the knowledge of concrete mix design	6	Design

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**
CO1	--	2	--	2	2	--	--	--	1	--	--	2
CO2	2	2	3	--	3	--	--	--	1	2	--	--
CO3	--	2	--	2	3	--	--	--	2	3	--	2

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE),

Assessment	Marks
ISE	25
ESE OE	25

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- ESE: Assessment is based on 100% course content

Course Contents:

Practical Exercises:

1. To determine the standard consistency, initial and final setting time of cement using Vicat's apparatus.
2. Determination of soundness of cement by Le-Chatelier's apparatus and Auto Clave.
3. To determine compressive strength of cement.
4. Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)
5. Determination of specific gravity and water absorption of aggregates.
6. To determine flakiness and elongation index of coarse aggregates.
7. To determine Workability of concrete by slump test, compaction factor, Vee Bee Consitometer test, effect of admixture and retarders on setting time concrete.
8. Non destructive test on concrete by:

   a) Rebound Hammer Test

   b) Ultrasonic Pulse Velocity Test
9. Mix design and compressive strength of concrete cubes for M20 or M30 (ACI 211.1-91, IS 10262- 2009 and IS 456)
10. Mix design and compressive strength of self compacting concrete and High performance concrete.

Recommended Textbooks:

1. Naville, A.M., Concrete Technology, Pearson Education.
2. Santakumar, A.R., Concrete Technology, Oxford University Press.
3. Shetty, M.S., Concrete Technology, S. Chand Publication.
4. Gambhir, M.L., Concrete Technology, Tata McGraw Hill.

IS codes:

5. IS: 10262,2009, Recommended guidelines for Concrete Mix Design
6. IS: 456, 2000, Indian Standard Plain and Reinforced Concrete

References Books:

1. Jayant D.Bapat (2013),Mineral admixtures in cement and concrete,Taylor and Francis group
2. 2. Noel P. Mailvaganam, M.R. Rixom (1999),Chemical Admixtures for Concrete, E.&F.N.Spon Ltd
3. 3. V. Mohan Malhotra (1997), Super-plasticizers and Other Chemical Admixtures in Concrete:Proceedings, Fifth CANMET/ACI International Conference, Rome, Italy
4. 4. P. Barnes, J. Bensted (2002) , Structure and Performance of Cements, Spon Press

Unit wise Measurable students Learning Outcomes:

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

Unit wise Measurable students Learning Outcomes:

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

1. Evaluate the properties of Concrete materials.
2. Evaluate the properties of Fresh concrete
3. Evaluate the properties of Harden concrete
4. Calculate mix design of concrete.

Title of the Course:	**Environmental Engineering – I Lab**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0432**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Students must have basic idea about Environmental Problems and issues regarding the application of knowledge of the concepts which are essential for understanding correlation of Engineering and Environmental Issues like water pollution and disposal problems.

Course Description:

This course will help the students to understand the importance and seriousness about pollution of Water and water treatment facilities and Civil Engineering aspects like Green buildings and water supply network.

Course Learning Objectives:

1. Assess the quality and carry out quantification of the given source of water for drinking purpose as per standards of I.S.10500.
2. Sequencing and design the water treatment units for various qualities of water depending on water source as per mentioned design parameters.
3. Analyze the water distribution system numerically and computationally with respect to water quality, water pressure and pipe quality.
4. Acquire the basic information of Green building and distinguish between conventional and green building.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Assess the quality of the given source of water for drinking purpose as per codal provision.	2	Cognitive
CO2	Design the water treatment units for various qualities of water depending on water source as per design parameters.	4	Cognitive
CO3	Analyze the water distribution system computationally with respect to water quality, water pressure and pipe quality.	5	Cognitive
CO4	Correlate the water treatment facility in the practice with theoretical knowledge.	4	Cognitive

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	1	3	--	1	--	3	--	--	--	--	1
CO2	3	2	2	3	1	3	3	1	--	--	--	1
CO3	3	2	2	2	1	3	3	1	--	--	--	1
CO4	1	--	2	1	--	--	3	1	--	--	--	1

Assessments :

Teacher Assessment:

The component **In Semester Evaluation (ISE)** would consist of continuous evaluation of all experiments performed (60%), design problems of treatment units (10%), utilization of software (20%) and Site visit report (10%).

Assessment	Marks
ISE	50
ESE POE	50

- **ESE POE:** Based on practical performance (40%) and oral examination (60%) the evaluation will be carried out.

Course Contents:

A Analysis of any 08 of the following test parameters for water

1. pH
2. Acidity
3. Alkalinity
4. Chlorides content
5. Hardness – Total, temporary and permanent
6. Turbidity
7. Residual Chlorine
8. Total dissolved solids through measurement of electrical conductivity
9. Dissolved Oxygen
10. Most Probable Number
11. Optimum dose of alum by jar test.

B Design/ Analysis problems on water treatment unit

C Analysis of distribution system using software

D Visit to a water treatment plant

Recommended Textbooks:

1. Water and Waste water Technology by Mark J. Hammer,John Wiely and Sons.
2. Introduction to Environmental Engineering by M. L. Davis and Davis A. Cornwell, Mc Graw Hill.
3. Environmental Engineering: A design approach by A.P. Sincero and G.A. Sincero. Prentice Hall of India.
4. Environmental Engineering by H.S. Peavy, D.R. Rowe. McGraw Hill
5. Water Supply Engineering by Dr. P. N. Modi, Standard Book House, New Delhi.
6. Water Supply Engineering by S. K. Garg, Khanna Publishers, New Delhi
7. Water Supply Engineering by Dr. B. C. Punmia, Laxmi Publishers, New Delhi

References Books:

1. Manual of water supply and treatment by Government of India publication.

Unit wise Measurable students Learning Outcomes:

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

1. Understand the water quality parameters and acceptance standards.
2. Study and design the aeration, coagulation flocculation and sedimentation.
3. Able to design the filtration process.
4. Understand transmission and leakages in pipes,
5. Analyze the water distribution system and make use of software.
6. Understand the details of green buildings.

Title of the Course:	**Computer Aided Drawing LAB**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0433**	**-**	**-**	**4**	**2**

Course Pre-Requisite:

CAD, Building Science And Services, Building Planning And Design

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.

Course Learning Objectives:

1. To develop plans of residential building
2. To develop plans of Public buildings
3. To develop Submission drawing and working drawings for a Project
4. To efficiently use CAD platform for developing all types of drawing.
5. To develop perspective drawing

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Utilize CAD platform to draw building drawings	3	Utilize
CO2	Design residential building plans on CAD	6	Design
CO3	Design Public building plans on CAD	6	Design
CO4	Apply concept of aesthetics to draw perspective drawing on CAD	3	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	2	-	1	2	-	-	-		2	3	-
CO2	2	1	1	2	-	1	2	2		2	3	-
CO3	2	2	1	1	-	2	-	-		2	3	-
CO4	2	3	-	1	-	-	-	-		2	3	-

Assessments :

Teacher Assessment:

Assessment	Marks
ISE	25
ESE POE	50

- ISE will be based on plan of buildings prepared on CAD platform throughout semester as per timeline issued.
- ESE: Assessment is based on 80% Project work and 20% Weightage for Project report content
- POE will based on drafting task issued for 2 hrs in present of external examiner

Course Contents:

Drawing on CAD

1. Draw a plan , elevation and section passing through staircase for minimum 8 type of building studied in BPD subject
2. Complete a project on any of the building* containing a submission drawing, centre line plan, furniture layout, plumbing drawing electrification drawing, perspective drawing.

* *If residential building is selected for project it should an apartment with G + 3 structure*

Recommended Textbooks:

1. Building Drawing – Shah, Kale, Patki (Tata McGraw- Hill)
2. Building Design and Drawing – Y. S. Sane (Allied Book Stall, Pune)
3. Civil Engineering Drawing – M. Chakraborty.
4. Construction Technology (Volume 1 to 4) – R. Chudley (ELBS)
5. A to Z of Practical Building Construction and Its Management- Sandeep Mantri
6. (Satya Prakashan, New Delhi)
7. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)
8. Engineering Materials – R.K.Rajput (S. Chand)

References Books:

1. SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
2. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
3. Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy (P)ltd

Measurable students Learning Outcomes:

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

1. Design and draft 8 types of building plan based on functional use with its elevation, section passing through staircase, site plan and block plan on CAD platform.

2. Design and draft single submission drawing and 5 working drawings on CAD platform.

Title of the Course:	**Advanced Surveying Lab**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0434**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Engineering Surveying theory and Lab & Advanced Survey Theory

Course Description:

The course mainly deals with Experiments, field work, methods and instruments for the Geodetic Surveying work with focus on finding the positions of objects on the surface of the Earth using indirect methods of surveying and trigonometry. Setting out curves for road and railway and survey. Modern tool of surveying are introduced in this course.

Course Learning Objectives:

1. To understand indirect and speedy method for distance and elevation calculations.
2. To practice methods for Curve Setting in engineering Survey of roads, railways.
3. To prepare for use of modern Engineering Tools especially for Larger Areas, i.e. geodetic Surveying.
4. To perceive higher methods of surveying using contemporary Techniques.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Carry out triangulation using modern tools and techniques	1	Cognitive
CO2	Select and identify Flight plan for drone survey, correlate Ground control points (GCPs) and use GIS,GNSS tools	1	Psychomotor
CO3	Demonstrate and apply the principles of trigonometry in indirect surveying.	3	Cognitive
CO4	Practice setting out operations for Curves for roads and railways.	4	Cognitive

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	-	-	1	1	-	-	-	2	2	-	2
CO2	2	1	1	1	2	1	1	-	2	2	1	3
CO3	1	1	-	2	2	3	-	-	3	3	1	1
CO4	1	1	2	1	3	-	-	-	3	2	2	-

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One ISE 1 and one ISE 2 having 40%, 60% weights respectively.

Assessment	Marks
ISE1(experiments)	10
ISE2-PBL	15

- ISE1 is based on practicals performed/Group Discussion/ Internal oral etc.
- ISE2-PBL is a mini-Project based on problem statement.

Course Contents:

Practical Work:

1. Tacheometry- Determination of tacheometric constants
2. Tacheometry- Determination of grade of a given line
3. Total station - Measuring distance, angle, vertical Intercept & R.L
4. Total station – Establishing Horizontal and vertical Control points for Large areas using rectangular coordinates.
5. Setting out of simple circular curves – Linear method (any one)
6. Setting out of simple circular curves –Angular method (any one)
7. Aerial photography by Drone survey and observation of stereo pair photos under stereoscope.
8. Use of GNSS system to measure and map waypoints and integrate in Google earth.

Survey Projects: Report and Project drawing sheets:

1. Theodolite Traversing and Gales Traverse table
2. Radial Contouring by Tacheometer

Recommended Textbooks:

1. Surveying Vol. I and II - S. K. Duggal, Tata McGraw Hill, New Delhi.
2. 2. B C Punmia, Surveying and Leveling, Vol I & II, Laxmi Publications.
3. 3. N.N. Basak, Surveying and Leveling, Tata McGraw Hill Publications, 1st Edition

References Books:

1. Surveying for Engineers-John Uren & Bill Price—Palgrave Macmillan
2. Plane Surveying----A.M. Chandra---- New Age International Publishers
3. Surveying Vol. I & II ---- Dr.K. R. Arora
4. Surveying: Theory and Practice --- James M. Anderson, Edward M. Mikhail
5. Surveying theory and practices -- Devis R. E., Foot F. S.
6. Plane and Geodetic surveying for Engineers. Vol. I -- David Clark

Unit wise Measurable students Learning Outcomes:

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

1. Understand Theodolite traversing and calculate omitted measurements.
2. Understand Tacheometry and EDM.
3. Understand and Design different types of Curves
4. Understand Geodetic surveying.
5. Understand Aerial Photogrammetry and Aerial photograph interpretations.
6. Understand definition, terminologies, principles and uses of RS,GIS and GNSS

Project Based Learning (PBL) under Advanced Surveying Lab	
Title of the Course:	**Advanced Surveying Lab**
Course Code:	**UCVL0434**

6. Problem Statement:

A developer wants to develop a land measuring 1 acre. They want to obtain Horizontal and vertical points over the Area which can be used by Architect to prepare drawings.

7. Abstract/Description of Problem Statement :

The problem requires using field work, methods and instruments of Surveying and using knowledge learnt in theory course for applying in field and finding solution to the problem.

The Survey work using various instruments has to be carried out in a time bound manner and filed book has to be filled up systematically.

The drawings in the form of Closed Traverse & contours are to be prepared.

Computation for polygon closure by balancing of traverse has to be carried out with high accuracy and Are has to be calculated in the shortest time.

8. Activities/Steps with duration to solve the problem:

Activity	Duration (Max)
➢ Milestone 1 • Introduction to PBL • Activities involved for problem statement with constraints • Explanation of rubrics	1 week
➢ Milestone 2 • Field work of Theodolite traversing using different Theodoliites. • Filed work for radial contouring by Tacheometry using modern instruments • Field book recording	4 week
➢ Milestone 3 • Preparing Gale's traverse table using software	1 week
➢ Milestone 4 • Preparing drawings for traverse and contour Sheet	2 week
➢ Milestone 5 • Computations for Area using Gales table & formulae	2 week

and software	
➢ Milestone 6 • Presentation of their work	2 week
Total	**12 Week**

9. Assessment Scheme:

Assessment (PBL-ISE2)	Marks (15)
Field work & Drawing work	8
Computations, Presentation ,Q & A	7

10. Evaluation Scheme:

Evaluation	Marks
Field work	03
Drawing work L-section sheet & Cross-section sheet	05
Computations for Earthwork	02
Presentation skills & Question & Answers	05
Total	15

Title of the Course:	**Building Planning and Design**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVL0461**	**3**	**-**	**-**	**-**

Course Pre-Requisite:

Building science and service, Energy simulation software,

Course Description:

Student will able to functionally plan residential and public buildings with all comfort, services and regulatory aspects

Course Learning Objectives:

1. To study General bye law requirements for planning all types of buildings
2. To select suitable site as per requirements of occupants of buildings
3. To acquire knowledge of procedure to sanction a building proposal from local town planning authority.
4. To apply knowledge of residential and public building principles to develop a plan.
5. To develop elevation and aesthetics of proposed building based architectural concept.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Build knowledge of Bye laws for buildings	3	Build
CO2	Develop submission drawing for all types of buildings	3	Develop
CO3	plan residential and public building according occupant's requirements	6	Plan
CO4	Design building service requirements based on use of building	6	Design

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	2	-	1	2	-	-	-		2	3	-
CO2	2	1	1	2	-	1	2	2		2	3	-
CO3	2	2	1	1	-	2	-	-		2	3	-
CO4	2	3	-	1	-	-	-	-		2	3	-

Assessments :

Teacher Assessment:

- **Not Applicable**

Course Contents:	
Unit 1: Introduction to Building bye laws Types of zones of development in a town. Layout requirements for township and plots more than 1 acre. Building bye laws includes open spaces, building line, control line, floor area ratios, height of building, parking and tenements requirements as per local authority.	**4 Hrs.**
Unit 2: Building spatial Planning dor disable and elderly person Anthropometrics, access Route, ramps, staircases, handrails, corridor, lobby and pathways, doors, toilets ,bathrooms and shower compartments .signage ,public information or reception counters ,illumination, lifts ,escalators ,other building services.car parking.	**8 Hrs.**
Unit 3: Building planning services Types of Residential buildings, Principles of Planning for Apartments, Residence for EWS, Residence of Govt. Officials, Hostels. Air conditioning: Purpose, Classification, Principles, Systems and various components. Noise control: general consideration.	**4 Hrs.**
Unit 4: Educational and Institutional buildings Types of Educational and institutional buildings, Principles of planning for primary & secondary schools, Colleges (all category), educational campus with residential arrangement.	**8 Hrs.**
Unit 5: Health care centre and Hotels Types of Health centre and its planning principles includes clinics, dispensaries, hospitals classified based on bed count and specialization, multispecialty hospitals, Hospitals with educational & residential facility. All types of hotels based on star rating and its planning principles.	**8 Hrs.**
Unit 6: Recreational Buildings and Administrative Offices Types of recreational facility and planning principles for drama theatre, cinema halls, multiplex, auditorium, exhibition hall. Planning of government offices including collector office, Court building, post offices, banks etc.	**8 Hrs.**

Recommended Textbooks:

1. Building Drawing – Shah, Kale, Patki (Tata McGraw- Hill)
2. Building Design and Drawing – Y. S. Sane (Allied Book Stall, Pune)
3. Civil Engineering Drawing – M. Chakraborty.
4. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)

References Books:

1. A to Z of Practical Building Construction and Its Management- Sandeep Mantri (Satya Prakashan, New Delhi)
2. SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
3. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
4. Time Saver Standard.
5. Neuferts Data
6. Guidelines and space standard for barrier free building environment for disabled and elderly person.-1998

Unit wise Measurable students Learning Outcomes:

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

1. Student will able to study building bye laws
2. Student will able to develop submission drawings
3. Student will able to develop working drawings.
4. Student will able to study residential building planning
5. Student will able to study public building planning