Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information	
Programme	B.Tech. (Civil Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	6MA201
Course Name	Applied Mathematics for Civil Engineering
Desired Requisites:	Engineering Mathematics I and Engineering Mathematics II

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	0 Hrs/week	30	20	50	100
		Credits: 3			

Course Objectives

1	To impart mathematical skills and enhance thinking power of students.
2	To introduce fundamental concepts of mathematics and their applications in engineering fields

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Explain basic concepts of Vector calculus and it's applications	Understanding
CO2	Apply PDEs for solving Engineering problems.	Apply
CO3	Solve problems pertaining to Fourier series, statistics and probability.	Apply

Module	**Module Contents**	**Hours**
I	**Fourier Series** Periodic functions, Dirichlet's conditions, Definition, determination of Fourier coefficients(Euler Formulae),Expansion of functions, Even and odd functions, change of interval and functions having arbitrary period, Half range Fourier sine and cosine series	7Hrs
II	**Partial Differential Equations:** Four Standard forms of partial differential equations**,** application to one dimensional heat equation	6Hrs
III	**Statistics** Correlation, Linear regression, curve Fitting(i) straight line (ii)Parabolic curve (iii) logarithmic curve	7Hrs
IV	**Probability Distribution:** Poisson Distribution, Gaussian distribution , Exponential distribution	6Hrs
V	**Vector Differentiation**: Concept of vector field, directional derivatives, gradient of vector field, tangent line to the curve, velocity, acceleration, divergent and curl of vector field, conservative vector field	7Hrs
VI	**Vector Integral**: Line integrals, surface and volume integral, Green's theorem in plane, Gauss divergence theorem, Stoke's Theorem.	7Hrs

Textbooks

1	P. N. and Wartikar J. N., "A Text Book of Applied Mathematics, Vol I and II", Vidyarthi GrihaPrakashan, Pune, 2006.

2	Grewal B .S., "Higher Engineering Maths", Khanna Publication, 39th Edition, 2005
3	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Limited Publication, 1st Edition, 1978
References	
1	Wylie C.R., "Advanced Engineering Mathematics", Tata McGraw Hill Publication, 8thEdition, 1999.
2	Dass H. K., "Advanced Engineering Mathematics", S. Chand & Company Ltd., 1st Edition, 1988.
3	S.Ross, "Probability and Statistics for Engineers and Scientists"

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1													1
CO2	2	1												1
CO3	2	1												1

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2023-24					
Course Information					
Programme	B.Tech. (Civil Engineering)				
Class, Semester	Second Year, III				
Course Code	6CV202				
Course Name	Fluid Mechanics and Hydraulic Machines				
Desired Requisites:	Engineering Physics, Engineering Mechanics and Mathematics				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	0 Hrs/week	30	20	50	100
		Credits: 3			

Course Objectives	
1	To provide fundamentals of fluid mechanics.
2	To impart the necessary knowledge on pipe flow hydraulics and its applications.
3	To prepare for higher studies and research in the field of fluid mechanics.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	*Explain* the fundamentals of fluid mechanics, hydraulic machines and boundary layer theory	Understanding
CO2	*Solve* problems pertaining with fluid statics and dynamics.	Applying
CO3	*Estimate* the different losses in pipe flow and efficiency of hydraulics machines	Analysing

Module	**Module Contents**	**Hours**
I	**Fluid Properties and Statics:** Scope and importance of Fluid Mechanics, Physical Properties: density, specific weight, specific volume, specific gravity, dynamic and kinematic viscosity, compressibility, surface tension and capillarity and Vapor pressure. The basic equation of hydrostatics, Pascal's law, Concept of pressure head, datum, absolute and gauge pressure, Measurement of pressure, Application of the basic equation of hydrostatics. Principle of floatation and Buoyancy, Equilibrium of floating bodies, Stability of floating bodies.	8
II	**Fluid Kinematics:** Introduction of basic terms: Path line, streak line, stream line and stream tube, Velocity and acceleration of fluid particle. Types of flow: steady and unsteady, uniform and non-uniform, Laminar and Turbulent, one, two, three-dimensional flow, rotational and irrotaional flow. Flow net: Equation of stream line and equipotential line, methods of developing the flow net and its uses.	6
III	**Fluid Dynamics:** Forces acting on fluid mass in motion, Euler's equation of the motion along a streamline, Bernoulli's equation: assumptions,	6

	applications and its limitations. Momentum equation and its application in fluid mechanics. Applications of Bernoulli's Equation**:** Analysis of the hydraulic coefficients for the discharge measuring devices: orifices , mouthpieces, venturimeter, pitot tube, notches and weirs. Analysis of losses in closed and open channel flow.	
IV	**Flow in Pipes:** Laminar Flow: Reynolds's Experiment, laminar flow through fixed parallel plate , Coutte's flow and Hazen Poiselle's equation for circular pipes. Turbulent Flow: Velocity distribution and shear stresses in turbulent flow, Nikuradse's experiments, Elementary concepts of turbulent flow in smooth and rough pipes. Losses in Pipes**:** Losses in Pipes: Darcy Weisbach equation and minor losses in flow through pipe, Concept of equivalent length of pipe and diameter of pipe. Analysis of losses in pipe for the pipes connected in series, parallel and Siphon. Solving the two reservoir problem, three-reservoir problem and Pipe Network analysis.	10
V	**Boundary Layer Theory:** Concept of boundary layer, Development of boundary layer on a flat plate, different thickness. Drag and lift of submerged bodies, Hydro dynamically smooth and rough boundaries, Boundary layer separation and its control.	5
VI	**Pump and Turbine:** Centrifugal pump: type, component parts and working of pump. Pelton wheel turbine: type, working and principle of Pelton wheel turbine.	5
Textbooks		
1	Modi P.M. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House Standard Book House Since; 21St Edition , 2018.	
2	Garde- Mirajgaonkar, "Engineering Fluid Mechanics", SCITECH Publication,1st Edition, 2010.	
3	Bansal R.K., "A textbook of Fluid mechanics and hydraulic machines", Laxmi Publications (P) Ltd., New Delhi, 9th Edition, 2010.	
References		
1	Kumar D.S., "Fluid Mechanics and Fluid Power Engineering", Kataria S K and Sons, 2th Edition, 2010.	
2	Jain A.K., "Fluid Mechanics Including Hydraulic Machines", Khanna Publishers, New Delhi, 8th Edition, 2003.	
3	Streeter, V.L. and Wylie E.B. "Fluid Mechanics", McGraw Hill, New York, 8th Edition,1985.	
Useful Links		
1		

CO-PO Mapping														
	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2												1	2
CO2		3											2	2
CO3		3											3	2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information	
Programme	B. Tech. (Civil Engineering)
Class, Semester	SY, III Semester
Course Code	6CV203
Course Name	Building Materials and Construction
Desired Requisites:	Nil

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	Impart in-depth knowledge of the various materials and techniques in Building Construction.
2	Articulate the role played by various building components and their interactions for an integrated behavior of the building as a whole.
3	Establish the representation of building components in terms of sketches and drawings.

Course Outcomes (CO)		
CO	Description	Blooms Taxonomy
CO1	**Distinguish** the strengths and weaknesses of various building materials by assessment and comparison of quality parameters, and **interpret** their applications in building components in context to strength and energy efficiency.	Understand and Apply
CO2	**Classify** the various components and their relationships in buildings with different structural systems and **identify** the materials and construction techniques to be adopted.	Apply
CO3	Illustrate the various building components in terms of scaled engineering drawings.	Apply

Module	**Module Contents**	**Hours**
I	**Building Systems – Conceptualization** The need for buildings, Defining Sustainability for Building systems, Concept Matrix for Buildings, Expansion and Conversion, Structural systems; Load bearing, Framed, Prefabrication, Pre Engineered Construction, Loads on Building, Components in Buildings and their functions, General properties of materials and their role in Construction, Sustainability Concepts, Current Problems, Green building Technologies, Life cycle energy in buildings.	6
II	**Building Materials** Origin, types, Engineering properties and Applications of Stone, Brick, Lime, Cement, Mortar, Steel, Specifications as per IS codal provisions.	7
III	**Foundations, Walls and Columns** **Foundations:** Definition and Functions, Structural Requirements, Bearing Capacity of Soils, Materials used and their properties, Types of Shallow and Deep foundations, Conditions for their applications, Plinth and Plinth Beams. **Walls and Columns:** Structural and Functional requirements, Types of Units and Mortars and their properties, Factors affecting strength and stability of walls, Functions of wall in buildings, Types: Stone masonry, Brick masonry, Concrete Block masonry, Types of Bonds, Cavity walls, Function and types of columns.	7

IV	**Openings in Buildings** Physical and Functional roles of Openings, Materials Involved, Means of providing openings, Criteria for sizes of Openings, Functional types of Doors, Windows, Ventilators., Openings vs. Internal Comfort, Role of Lintel and Chajja. Stair Cases- Characteristics, types, design criteria.	6
V	**Roofs and Floors** Definitions, Accessible and Inaccessible roofs, Structural and functional requirements, Load considerations, Types of Sloped roofs, Types of Flat roof/floor, Roof covering materials, Types of RC slabs, Role of concrete and steel reinforcement, Formwork, Application of DPC, Joints in construction, Cost effective and Sustainable roofs.	7
VI	**Building Services and Finishes** Types and requirements of Building Services, Integrated approach to planning in aspects like aesthetics, viz. Plumbing for water supply and sanitation, Electrification. Types of Finishes for Wall, Floor, Roof, Ceilings. Types of Paints and their applications, Defects in finishes.	7

Text Books	
1	Rajput R. K. . „Engineering Materials" S. Chand Publications, New Delhi, Edition 2014.
2	Arora S.P. and Bindra S.P., "Building Construction", Dhanpat Rai and Sons, Edition 2014.
3	Punmia B.C., Jain Ashok Kumar, Jain Arun Kumar, "Building Construction" Laxmi publications, 5th Edition, 2005.

References	
1	Mantri Sandeep, „The A to Z of Practical Building Construction and its Management" Satya Prakashan, New Delhi, 2014
2	Birdie and Ahuja, "Building Construction and Construction Materials", Dhanpat Rai and Sons, 4th Edition, 2012
3	Duggal S.K. „Building Materials" New Age International, 3rd Edition, 2008,

CO-PO Mapping

	Programme Outcomes (PO)												**PSPO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2											2	
CO2		2												2
CO3	2		2										2	

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of a teacher"s assessment. The mode of assessment can be field visits, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed, and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2023-24

Course Information	
Programme	B. Tech. (Civil Engineering)
Class, Semester	Second Year B. Tech, Sem III
Course Code	6CV205
Course Name	Engineering Surveying
Desired Requisites:	-

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	--	30	20	50	100
		Credits: 3			

Course Objectives	
1	To impart basic principles of conventional surveying through class instructions.
2	To develop a basic understanding of computations made in topographic mapping, and land Surveys.
3	To develop an ability to analyze land profiles in logical manner and will be able to apply well understood principles in planning and design of engineering structures on the Earth's surface.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Apply their knowledge to evaluate alternate surveying techniques suitable for scope of the project and site situation.	Applying
CO2	Identify Surveying equipment, work in team, collect and analyze the topographical data with due consideration to systematic errors, random errors and blunders	Identify
CO3	Perceive modern surveying equipment and techniques	Understanding

Module	**Module Contents**	**Hours**
I	**Introduction to Land Survey Systems** A. Study of conventional land survey systems, Brief review of basic Concepts. B. Types of measurements and range of instrumentation, Traversing & Trilateration C. Precision in Survey measurements, probable errors in measurements,	6
II	**Measurement of Horizontal and Vertical Distances; Angles and Directions** A. Methods and equipment for horizontal distance measurement, errors and corrections B. Methods and equipment for vertical distance measurement, errors and corrections C. Constructions, adjustments & uses of major and minor conventional angle measuring equipment, Methods for angle and direction measurement, errors and corrections	6
III	**Conventional Surveying Methodologies** A. Chain & Compass Survey B. Levelling & Contouring; Essentiality of Precise Levelling C. Theodolite Traversing ; Trigonometric levelling D. Tacheometric Survey E. Plane Table Survey	7

IV	**EDM Instrumentation** Basics of EDM, advances in technology, Fundamental parameters for calculation, correction factors and constants; Setting up, leveling, initial general settings, back sighting, station codes, overview of system functions and applications; and data retrieval and processing	8
V	**Project Surveying** Detailed surveys, Horizontal Control, Vertical Control, Methods for Location, Survey for Route, Bridge, Dam, Reservoir and Tunnel	7
VI	**Modern Techniques of Surveying and Mapping** Modern techniques and procedures for Aerial, Remote Sensing, GIS, GPS, LIDAR, 3D Scanner, Data interpretation and analysis, Elements of visual interpretation, and digital image processing	6

Textbooks	
1	Punmia B. C. and Jain, "Surveying", Vol. 1, 2 & 3, Laxmi Publications, New Delhi. 17th edition, 2015.
2	Basak N. N., "Surveying and Levelling", Tata Mcgraw Hill Education Pvt. Ltd, New Delhi, 2nd Edition, 2017.
3	Arora K. R. "Surveying", Vol. 1 & 2, Standard Book House, Kota 16th edition, 2018,.
4	
References	
1	Duggal S. K, "Surveying", Tata Mcgraw Hill Education Pvt Ltd, 4th edition, Delhi, 2017.
2	Bannister and Raymond, "Surveying", ELBS, Longman Group Ltd., England.
3	Davis R. E., F. Foote and J. Kelly, "Surveying; Theory and Practice", McGraw Hill Book Company, New York.
Useful Links	
1	https://www.youtube.com/playlist?list=PLIaVyn1ykyAiC87uyMQB-XcC0C8f4YMc5
2	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3												1	1
CO2		2			1				2				1	1
CO3					3									1

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE, and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of a teacher's assessment. Mode of assessment can be field visits, assignments, etc., and is expected to map at least one higher-order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing).

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AY 2023-24

Course Information	
Programme	B. Tech. (Civil Engineering)
Class, Semester	Second Year, III
Course Code	6CV206
Course Name	Strength of Materials
Desired Requisites:	Engineering Mechanics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	--	30	20	50	100
		Credits: 3			

Course Objectives	
1	To impart the basic concepts of stress and strain in the elastic body.
2	To illustrate internal effects and deformations caused by the various applied loads.
3	To provide knowledge of stability analysis, shear, and bending stress distribution for the analysis and design aspects of structural engineering.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Explain the state of stress-strain and internal forces in elastic bodies.	Understanding
CO2	Solve problems related to stress-strain in structural members and stability of structures.	Applying
CO3	Analyze different stresses in structural members.	Analysing

Module	**Module Contents**	**Hours**
I	**Stresses and Strains** Mechanical properties of materials – Elasticity, Plasticity, Linear, Lateral, Shear, and Volumetric Strains, Stresses, Elastic Constants, and Their Relationships, Poison's Ratio, Material Constitutive Law, St. Venant's Principle, Stress-Strain Curves for Brittle and Ductile Materials, Allowable Stresses, Factor of Safety, Uniaxial and Multi-axial Loading.	6
II	**Composite Sections under Axial Loading** Stresses, Strains and Deformations in Homogeneous and Composite Bars, Thermal Effects, Axial Force Diagram, Equilibrium and Compatibility Equations, Strain Energy due to Gradually and Suddenly Applied Axial Loads and Impact Load, Modulus of Resilience.	7
III	**Principal Stresses and Planes** State of Stress on Planes, Normal and Shear Stresses on any Oblique Plane, Principal Planes and Principal Stresses, Mohr's Circle Method, Principal Stresses in Beams, Various Theories of Elastic Failures.	7
IV	**Shear and Bending of Beams** Concept of Shear Force and Bending Moment, Relation between Shear Force, Bending Moment and Intensity of Loading, Plotting Shear Force Diagram and Bending Moment Diagram for Determinate Simple and Compound Beams under Various Types of Loads and Supports. <u>Bending and Shear Stresses:</u> Euler's Beam Theory, Moment of Resistance of Cross Section, Bending and Shear Stress Distribution Across Symmetrical and Unsymmetrical Cross Sections.	8
V	**Torsion of Circular Shafts** Theory of Torsion, Solid and Hollow Circular Shafts, Transmission of Power	6

	through Circular Shafts, Shaft Subjected to Bending and Torsion, Equivalent Shear, Equivalent Bending, Effect of End Thrust.	
VI	**Stability Analysis** Short Column, Slenderness Ratio, Euler's Theory, Critical Load, Rankine's Theory, Jordon's Formula, Secant Formula, Column Subjected to Combined Axial Load and Bending Moment, Core of a Section, Stability of Dams, and Retaining Walls.	6

Textbooks	
1	Ramamrutham S. and R. Narayan, "Strength of materials", Dhanpat Rai Publishing Co. Pvt. Ltd., 20th Edition, 2020.
2	Bansal R .K., "Strength of materials", Laxmi publications, NEW Delhi, INDIA, 6th Edition, 2018.
3	Rajput R. K., "Strength of Materials", S. Chand Publishing, NEW Delhi, INDIA, 6th Edition, 2015.
4	Junnarkar S. B. and Shah H. J., "Strength of Materials", Charotar Publishing House Pvt. Ltd.,15th Edition, 2012.
References	
1	Beer and Johnston, "Mechanics of Material", Tata McGraw Hill Publication, 7th Edition, 2014.
2	Andrew Pytel and Jaan Kiusalaas, "Mechanics of Materials", Cengage Learning, USA, 2nd Edition 2011.
3	Timoshenko S. and Young D. H., "Strength of Materials", McGraw Hill Book Company Publication, 4th Edition, 2006.
4	Gere and Timoshenko, "Mechanics of Materials", CBS Publishers, 2nd Edition, 2004.
Useful Links	
1	NPTEL :: Mechanical Engineering - Strength of Materials
2	Introduction - Strength of Materials - YouTube
3	NPTEL : Strength of Materials (Mechanical Engineering) (digimat.in)
4	Lec-2 Strength of Materials - YouTube

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2												1	2
CO2	3	3											1	2
CO3	2	3											1	2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE, and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of a teacher's assessment. Mode of assessment can be field visits, assignments, etc., and is expected to map at least one higher-order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing).

Walchand College of Engineering, Sangli

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Course Information

Programme	B.Tech. (Civil Engineering)
Class, Semester	Second Year , III
Course Code	6CV252
Course Name	Fluid Mechanics Laboratory
Desired Requisites:	Engineering Physics , Fluid Mechanics

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	--	30	30	40	100
		Credits: 1			

Course Objectives

1	To provide hands-on practice for determining various properties of fluids and conduct experiments to study pipe flow.
2	To develop the analytical skills required for interpretation and analysis.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	***Experiment*** to find different fluid properties and measure pressure in pipes.	Applying
CO2	***Demonstrate*** electrical analogy method to determine flow patterns and conduct experiment to determine metacentric height of ship models.	Applying
CO3	***Estimate*** the losses in pipe flow and study performance of centrifugal Pump and Pelton wheel turbine.	Analysing

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Determination of viscosity of oil by using Redwood viscometer
2. Determination of metacentric height of ship model
3. Development of Flow net by using electrical analogy method
4. Verification of Bernoulli's theorem for the energy equation
5. Verification of momentum equation by using impact of jet on circular disc
6. Measurement of discharge by using sharp edged circular orifice and Venturimeter
7. Study of different types of flow by using Reynolds experiment
8. Measurement and calculation of minor losses are due to entrance, exit, expansion of flow, contraction of flow, elbow, bent and valve
9. Measurement of Loss of head for the pipe flow by using differential U-tube Manometer
10. Study of characteristics of Centrifugal Pump and Pelton Wheel Turbine under constant speed.

Textbooks

1	Likhi, S.K., "Hydraulics: Laboratory Mannual", New Age International Publishers, 1 st Edition, 1995.
2	Aswa G.L., "Experimental Fluid Mechanics", Vol. I & II, Nem Chand & Bros., Roorkee, 1 st Edition, 1983.
3	Rangaraju K.G., "Flow in Open Channels", Tata McGraw Hill Publication Co. Ltd., New Delhi,1 st Edition,1993.

References

1	Modi P.M. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard BookHouse, 9th

	Edition,2013.
2	Subramanya K., "Theory and Applications of Fluid Mechanics" Tata McGraw Hill Publishing Co., Ltd., 7 th Edition2000.
3	Ven Te Chow, "Open channel Hydraulics", Tata McGraw Hill Publishing, 1 st Edition,2000.

CO-PO Mapping														
	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1				3									1	1
CO2				3									1	1
CO3				3									1	1
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

Programme	B.Tech. (Civil Engineering)
Class, Semester	Second Year, III
Course Code	6CV253
Course Name	Building Materials and Construction Lab
Desired Requisites:	--

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 hrs/week				
Interaction	-	**Credits: 1**			

Course Objectives

1	Demonstrate tests on certain civil engineering materials as per standards
2	Relate the theoretical learnings by conducting visits to Construction Sites
3	Impart the fundamentals of civil engineering drawings in construction.

Course Outcomes (CO)

CO	Description	Blooms Taxonomy
CO1	**Interpret** the suitability of construction materials by testing as per standards	Apply
CO2	**Perceive** the correctness of materials and techniques used on construction sites.	Understand
CO3	**Demonstrate** the various building components in terms of scaled drawings	Apply

List of Experiments / Lab Activities

List of Experiments (weekly):

1. Compressive strength and Water Absorption of Brick/Block as per IS 3495 Part I and II..
2. Sieve analysis and Fineness Modulus of Fine Aggregate (IS 2386 Part I).
3. Determination of Bulking of Sand: Lab method and IS method (IS 2386 Part III).

   LA1-Evaluation of the previous 3 activities.
4. Site Visit to a Local Building under Construction to observe Foundation Details.
5. Site Visit to a Local Building under Construction to observe Masonry Construction.
6. Market Survey of Building Materials – A Self Study.

   LA2-Evaluation of the previous 3 activities.
7. Construction Details and Drawings of Door and Windows and Staircase.
8. Site Visit to a Local Building to observe Framed Construction and Plumbing Details.

   ESE - End semester Evaluation based on all experiments

Text Books

1	IS 3495 (Parts 1 to 4) : 1992 Indian Standard Methods of Tests of Burnt Clay Building Bricks, Bureau of Indian Standards, Manak Bhavan. 9 Bahadur Shah Zafar Marg, New Delhi
2	IS : 2386 (Part III) - 1963 (Reaffirmed 2002) Indian Standard Methods of Test for Aggregates for Concrete, Bureau of Indian Standards, Manak Bhavan. 9 Bahadur Shah Zafar Marg, New Delhi
3	Mantri Institute's 'The A to Z of Practical Building Construction and its Management' Mantri Institute of Devp. and Research. Pune, Published by Satya Prakashan, 2011

References

1	Gambhir M L, Jamwal Neha, Building and Construction Materials: Testing and Quality Control, Tata McGraw-Hill Education, 2014

Useful Links	
1	Material Testing-lab-manual: http://site.iugaza.edu.ps/mymousa/files/Material_-Testing-lab-manual.pdf

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2			1	1								2	
CO2						1		1					2	
CO3	2				1									2
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2, and Lab ESE IMP: Lab ESE is a separate head of passing. Lab ESE is treated as End Semester Exam and is based on all experiments/lab activities.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab Performance and documentation	Lab Course faculty	During Week 13 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.				

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information

Programme	B. Tech. Civil Engineering
Class, Semester	Second Year B. Tech., Semester I
Course Code	6CV257
Course Name	Engineering Geology Laboratory
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	1 Hrs/ Week	30	30	40	100
		Credits: 2			

Course Objectives

1	Introduce students the properties of Minerals and Rocks and enable them to identify them.
2	Introduce them technique of drawing the cross sections from given geological outcrop maps of various types, solving structural geology problems.
3	Enable students to understand geological problem with the help of subsurface investigation data and stratigraphic formations of India.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Identify and describe the given mineral and rock specimen.	Understand
CO2	Construct cross section from given geological outcrop map and solve any structural geology problem and interpret the same for civil engineering decision making.	Apply
CO3	Summarize the core logging from the recovered core data and interpret the subsurface conditions by correlating the same.	Understand, Apply

List of Experiments / Lab Activities/Topics

List of Topics (Applicable for Interaction mode):

Mineralogy, Petrology, Structural Geology and Maps, Subsurface Geological Observations, Stratigraphy.

List of Lab Activities:

Ex1. Identify and describe megascopic properties of minerals.
Ex.2. Describe the minerals from Silica, Feldspar, Olivine, Pyroxene, Amphibole and Mica group of minerals.
Ex.3. Describe the minerals from Garnet, Carbonate, Sulphate, Zeolite, Other silicates and Ore mineral groups
Ex.4.Petrographic identification of Igneous Rocks.
Ex.5.Petrographic identification of Metamorphic Rocks.
Ex.6.Petrographic identification of Sedimentary Rocks.
Ex.7. Geological Outcrop Map with Horizontal Series
Ex.8. Geological Outcrop Map with Inclined Series
Ex.9. Geological Outcrop Map with Two series and one Unconformity
Ex.10.Geological Outcrop Map with Dykes and Sill.
Ex.11.Geological Outcrop Map with Vertical Fault.
Ex.12. Core logging Report and Interpretation.
Ex.13.Study of Geological Map of India
Ex.14.Study of Geological Map of Maharashtra

Textbooks

1	Parbin Singh,"Engineering and General Geology", , S. K. Katariya and Sons, Delhi.,1984, 1st Edition.
2	K. M. Bangar., "Principles of Engineering Geology", Standard Publishers Distributors 1705-B Nai Sarak, Delhi.

3	N. Chenna Kesavulu, “Textbook of Engineering Geology”,Macmillan India Ltd. 2/10 Ansari Road Daryanganj, New Delhi.
References	
1	A. Holmes, “Principles of Physical Geology”, ELBS Chapman and Hall, London.
2	M. S. Krishnan,” Geology of India and Burma”, CBS Publishers & Distributors
3	Dr. D. V. Reddy “Engineering Geology for Civil Engineering”, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1995, 1st Edition.
Useful Links	
1	https://www.youtube.com/watch?v=iCDVqhcEcE&list=PLpk11CHBpb6sDDa_ooZuKb7dm_LKWvBNl
2	https://www.youtube.com/watch?v=kqbLyfWfmxE&list=PLpk11CHBpb6uAS4cfQ8p9Qc9mHzLNGLtX
3	https://www.youtube.com/watch?v=fiMemypKqEI&list=PLHyuArGIIyyR_2mObwQ3yng18LDnDqidp
4	https://www.youtube.com/watch?v=8NY7-yvpdl4

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3								1					
CO2	3								1					
CO3	3								1					
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 5 Marks Submission at the end of Week 5	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 6 to Week 11 Marks Submission at the end of Week 11	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 12 to Week 13 Marks Submission at the end of Week 13	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

Programme	B.Tech. (Civil Engineering)
Class, Semester	Second Year B. Tech., Sem : III
Course Code	6CV255
Course Name	Engineering Surveying Laboratory
Desired Requisites:	Engineering Surveying.

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	0 Hrs/ Week	30	30	40	100
		Credits: 2			

Course Objectives

1	To study basic surveying techniques through field exercises.
2	To develop and retain a basic understanding of site selection, locational survey, horizontal and vertical control establishment in the field with computations made in land Surveys.
3	

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Implement appropriate surveying methodology.	2
CO2	Study topographic feature	3
CO3	Verify suitability of site condition for major engineering project	4

List of Experiments / Lab Activities/Topics

List of Experiments:

Part I: Field Exercises (inside the campus)

1. Chain & Compass Traversing
2. Plane Table Survey
3. Levelling:

a. Study of Dumpy, Auto, and tilting level

b. Levelling exercises

4. Theodolite & Trigonometric levelling:

a. Angle measurement and traversing by theodolite

b. Study of micro optic theodolite c. Line out of Structures.

5. Tacheometry:

a. Determination of constants of Tacheometer

b. Stadia tacheometry for length, gradient, and area determination

Part II: Field Projects (outside the campus)

6. Road Surveying (Alignment, Earthwork calculations etc.)
7. Block and Radial Contouring (Interpolation calculations, Drawings etc.)

Textbooks

1	Punmia B. C. and Jain, "Surveying", Vol. 1, 2 & 3, Laxmi Publications, New Delhi. 17th edition, 2015.
2	Basak N. N., "Surveying and Levelling", Tata Mcgraw Hill Education Pvt. Ltd, New Delhi, 2nd Edition, 2017.
3	Arora K. R. "Surveying", Vol. 1 & 2, Standard Book House, Kota 16th edition, 2018,.
4	

References

1	Duggal S. K, "Surveying", Tata Mcgraw Hill Education Pvt Ltd, 4th edition, Delhi, 2017.
2	Bannister and Raymond, "Surveying", ELBS, Longman Group Ltd., England.
3	Davis R. E., F. Foote and J. Kelly, "Surveying; Theory and Practice", McGraw Hill Book

	Company, New York.
4	
Useful Links	
1	

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1									2				1	1
CO2				2					2				1	2
CO3				2					2				1	2
CO4														
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

Programme	B. Tech (Civil Engineering)
Class, Semester	Second Year B. Tech Sem-IV
Course Code	6CV256
Course Name	Strength of Material Lab
Desired Requisites:	Engineering Mechanics and Strength of Material

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	---	30	30	40	100
		Credits: 1			

Course Objectives

1	To demonstrate laboratory experiments for testing of various building materials.
2	To provide the knowledge of permissible values of material properties as per codal requirements.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Conduct experiment to determine the strength properties of construction materials.	Applying
CO2	Analyze and interpret properties of construction materials for acceptance criteria as per codal provisions/ Standards.	Analysing

List of Experiments / Lab Activities/Topics

List of Lab Activities:

Laboratory tests

1. Tension Test on mild steel & high strength deformed bars.
2. Compression test on mild steel & cast iron.
3. Shear test on mild Steel.
4. Hardness test on different materials.
5. Torsion test on mild steel & cast iron
6. Bending test on Timber.
7. Compression test on Timber
8. Impact Test for different metals.
9. Bending test on flooring tiles.

Textbooks

1	Ramamrutham S. and Narayan R., "Strength of materials", Dhanpat Rai Publishing Co Pvt Ltd. Publication Date 1 January 2011, ISBN-978-8187433545.
2	Bansal R.K., "Strength of materials", Laxmi publications, NEW Delhi - 110002, INDIA. Publication Date - 1 January 2014.
3	Rajput R.K., "Strength of Materials", S. Chand Publishing, NEW Delhi - 110002, INDIA. Publication Date -12-Jan-2023.
4	Junnarkar S. B., "Strength of Materials", Publisher: Charotar Publishing House Pvt.Ltd, Charotar Publication Edition: 32nd Edition, 2016 , ISBN: 9789385039270, 938503927X.

References

1	Beer and Johnston, "Mechanics of Material", Tata McGraw Hill publication, 7th Edition, 2014.
2	Andrew Pytel and Jaan Kiusalaas, "Mechanics of Materials", Cengage Learning, USA, 2nd Edition, 2011.

3	Timoshenko. S. & Young. D. H, “Strength of Material”, McGraw Hill Book Company Publication, 4th Edition, 2006.
4	Hibbeler R. C., “Mechanics of Materials”, Pearson Education, 10th Edition, 2016.
Useful Links	
1	LabManualLinks- https://home.iitm.ac.in/kramesh/Strength%20of%20Materials%20Laboratory%20Manual.pdf
2	https://nitsri.ac.in/Department/Civil%20Engineering/SOM_Lab_Manual.pdf
3	Virtual lab link - https://sm-nitk.vlabs.ac.in/

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3			1				1					1	
CO2	3	1		2				1					1	
CO3														

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, and preferably to only one PO.

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. (min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

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Course Information	
Programme	B.Tech. (Civil Engineering)
Class, Semester	Second Year, IV
Course Code	6CV225
Course Name	Open Channel Hydraulics
Desired Requisites:	Fluid Mechanics and Hydraulic Machines

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	0 Hrs/week	30	20	50	100
		Credits: 3			

Course Objectives	
1	To instil knowhow of open channel hydraulics as a prerequisite to design of hydraulic structures.
2	To impart basics of dimensional analysis and principles of physical modeling.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Explain fluid flow through open channels.	Understanding
CO2	Analyse the open channel flow to determine surface profiles and study energy dissipation.	Analysing
CO3	Apply principles of dimensional analysis and hydraulic model testing.	Applying

Module	**Module Contents**	**Hours**
I	**Introduction to open channel Flow:** Scope and importance ,Types of open channel, Types of flows in open channel, Geometric elements, Velocity distribution, Energy and momentum equation applied to open channel flow, Measurement of velocity and discharge	7
II	**Uniform Flow:** Uniform flow, Uniform flow characteristics, prismatic channel, Chezy's and Manning's Formulae, Manning's roughness coefficient, Uniform flow computations, Normal depth, Conveyance, Section factor, Hydraulic exponent, Hydraulically most efficient sections.	7
III	**Specific Energy and Specific Force:** Energy -Depth relationship in open channel flow, Specific energy - definition and diagram, Critical flow, Sub-critical and supercritical flow, Specific force -definition and diagram, Unit discharge and discharge diagram.	6
IV	**Gradually Varied flow:** Definition and types of non-uniform flow, Gradually Varied Flow (GVF) and Rapidly Varied Flow (RVF), Basic assumptions of GVF; Governing Differential Equation of GVF- Alternative forms; Classification of channel bed-slopes; Zones of GVF profiles; Various GVF profiles, their general characteristics and examples of their occurrence; Control section., Gradually varied flow computations.	8
V	**Rapidly varied flow:** Phenomenon of Hydraulic jump; Location and examples of occurrence of hydraulic jump; Assumptions in the theory of hydraulic jump; Application of momentum equation to hydraulic jump in rectangular channel; Conjugate	6

	depths and relation between conjugate depths. Various terms related to hydraulic jump; Classification of hydraulic jump; Practical uses of hydraulic jump. Energy dissipation in hydraulic jump; graphical method of determination of energy dissipation.	
VI	**Dimensional Analysis and model testing:** Dimensional analysis, Buckingham's theorem, Dimensionless numbers and their significance. Model similitude, Model laws, Theory and applications.	6

Textbooks	
1	Modi P.M. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, 9th Edition, 2013.
2	Ven Te Chow, "Open channel Hydraulics", Tata McGraw Hill Publishing, 1st Edition, 2000.
3	Rangaraju K.G., "Flow in Open Channels", Tata McGraw Hill Publication Co. Ltd., New Delhi, 1st Edition, 1993.

References	
1	Jain A.K., "Fluid Mechanics", Khanna Publishers, 11th Edition, 2013.
2	Subramanya K. , "Flow in Open Channels" Tata McGraw-Hill Education, 7th Edition, 2009
3	Chanson, "The Hydraulics of Open Channel Flow an Introduction", Wiley, 1st Edition, 2004.

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3												3	3
CO2		3											3	3
CO3			2	1									1	2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information	
Programme	B. Tech. (Civil Engineering)
Class, Semester	Second year, IV
Course Code	6CV221
Course Name	Building Planning and Design
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	Impart concepts in Building Planning and functional design.
2	Articulate integration of aesthetical concepts and influence of climate in building design.
3	Establish the art of expressing buildings in terms of drawings.

Course Outcomes (CO)		
CO	Description At the end of the course, the students will be able to,	Blooms Taxonomy
CO1	Perceive the requirements of residential/public building in terms of structural, functional aspects and apply the principles of planning, bye laws/regulations during planning process of buildings.	Understand and Apply
CO2	Practice the planning ideologies in buildings, in relevance to building services, climatology, acoustics and fire resistance.	Apply
CO3	Design buildings by composing functional and aesthetical aspects and illustrate building graphically in terms of engineering drawings.	Create

Module	**Module Contents**	**Hours**
I	**Site, Building and Building Drawings** Categories of buildings as per NBC, Types of Residential buildings, Site selection, Factors influencing selection of site, guidelines for planning and drawing of buildings, Positions of various building components, types of drawings and relevant scales.	6
II	**Principles of Building Planning** Conceptual understanding of Aspect, prospect, Privacy, Furniture, Roominess, Grouping, Circulation, Sanitation, Lighting, Ventilation, Flexibility, Elegance, Sanitation, Economy and their interrelationship in the integrated planning of buildings.	7
III	**Building Bye laws** Objectives, Minimum plot size, Building frontage, open spaces, exemption to open spaces, standard dimensions in buildings, Provision for light & ventilation, Means for access, Drainage & sanitation, FSI, Fungible FSI, Saleable areas, Transfer of development rights, RERA.	7
IV	**Climatology and Building design** Elements of climate, Climatic zones, Comfort indices, Direction and its characteristics, orientation of buildings, factors affecting orientation, Orientation criteria in various zones, Natural and Artificial means of achieving comfort.	7

V	**Aesthetics in Buildings** Conceptual understanding of Aesthetics, Subjective and Objective Aesthetics, Aesthetic theory, Influence of Indian Architecture, Aesthetics in Engineering Design, Formal elements of functional design, Composition in Building Architecture	6
VI	**Acoustics and Fire resistance in buildings** Applications, Sound ratings, conditions of good acoustics, Sound behavior in enclosures, Common acoustical defects, Echo & reverberation, acoustical design of auditoriums. Fire safety & role of designer, causes, fire loads & occupancies, Fire resistance of common building materials, general fire safety recommendations, Fire escapes, Alarms & extinguishing equipments.	7

Text Books	
1	Sikka V. B., Kataria S. K. and Sons ,Civil Engineering Drawing, 7th Edition, 2015
2	Kumarswamy and Kameshwar Rao., "Building Planning and Design," Charotar Publications, 8th Edition, 2010

References	
1	Pierce S Rowland, Planning: The Architect's Handbook "E. & OE" by Iliffe Books Ltd. London
2	John Hancock Callender, Joseph De Chiara, "Time Saver Standards for Building Types", McGraw-Hill, New York, 1983.
3	National Building Code of India 2016 (Vol I and II) SP- 7, Bureau of Indian Standards, New Delhi.

CO-PO Mapping

	Programme Outcomes (PO)												**PSPO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2											2	
CO2		2											2	2
CO3	2		2										2	

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of a teacher's assessment. The mode of assessment can be field visits, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed, and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2023-24

Course Information	
Programme	B. Tech. (Civil Engineering)
Class, Semester	Second Year B. Tech., Semester IV
Course Code	6CV222
Course Name	Water Resource Engineering
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	03 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 03			

Course Objectives	
1	To impart fundamental concepts in hydrology and irrigation.
2	To introduce sustainable watershed management practices.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Explain** concepts in hydrology and irrigation engineering.	Understanding
CO2	**Estimate** various components of hydrological cycle, crop water requirement and yield of well.	Analysing
CO3	**Apply** principles of watershed development for sustainable water and soil conservation solutions.	Applying

Module	**Module Contents**	**Hours**
I	**Introduction to hydrology** Hydrological cycle and application of hydrology. Precipitation: Types of Precipitation, measurement, analysis of Precipitation data, mass rainfall curves, intensity-duration curves, and concept of depth area duration analysis, frequency analysis. Evaporation, transpiration, evapotranspiration and infiltration.	6
II	**Runoff** Rainfall-runoff relationships, Flow Duration Curve, Flow-mass Curve applications Hydrograph analysis: Factors affecting runoff, Unit hydrograph theory and applications. Stream flow measurement. Floods Estimation and control, flood frequency analysis, Introduction to flood routing.	7
III	**Groundwater hydraulics** Occurrence, Aquifers, hydraulic conductivity, transmissivity, Aquifer yield. Well irrigation: Well hydraulics, Tube wells- Types, Methods for drilling, Well Development. Open wells- Classification, Yield, Advantages and Disadvantages of well irrigation Ground water recharge methods and its efficiency.	6
IV	**Introduction to Irrigation Engineering** Water requirement of crops, Soil Water-Plant Relationship, Methods of Field Water Application, Effects of excess water for irrigation, cropping pattern, Irrigation Water management and distribution, Introduction to prevalent	8

	Government laws and water policy. Irrigation: Necessity, Survey and data collection for irrigation project, Reservoir planning and sediment control Types of Irrigation Schemes, performance assessment of irrigation scheme	
V	**Canal Irrigation** Canal and Canal structures, Canal lining, Diversion head works- Weir and Barrages, Cross-Drainage works- Aqueduct, Siphon aqueduct, Super passage, Canal siphon, Canal Maintenance, Canal revenue assessment methods, canal water losses and its preventive measures.	6
VI	**Water Shed Development** Check dam, Nala bund, Bandhara Irrigation- Construction and Working, Advantages and Disadvantages, Percolation tank- Need, Selection of site, Construction, Lift irrigation schemes- Layout, Components and functions. Watershed management, importance of stakeholder involvement, Soil conservation measures, Methods and design of Rainwater harvesting systems	7

Textbooks	
1	Garg S. K., "Water resources Engg. Vol. II, Irrigation Engineering & hydraulic Structures", Khanna publisher, Delhi, 24th edition, 2011.
2	Garg S. K., "Water resources Engg. Vol. I, Hydrology & water resources Engg.", Khanna publisher, Delhi, 15th edition, 2010.
3	Deodhar M. J., " Elementary Engineering Hydrology", Pearson Education, 1st Edition, 2009.
References	
1	Raghunath H. M., "Hydrology: principles, analysis, design", New Ace International (P) Limited, Publishers, 4th edition.
2	Punmia B. C., Pande Brij Basi Lal, Arun Kumar Jain, Ashok Kumar Jain, "Irrigation and Water Power Engineering", Laxmi Publications, 16th edition , 2009.
3	Asawa G. L., "Irrigation and Water Resources Engineering", New Age International Publishers, 1st edition , 2005.
Useful Links	
1	https://www.youtube.com/watch?v=7O7S173LqYM&list=PLwdnzlV3ogoU-zxx2wMFG_FSDsGKVQ93g&index=19
2	https://www.youtube.com/watch?v=1puBeXuS3ik&list=PLwdnzlV3ogoU-zxx2wMFG_FSDsGKVQ93g&index=22
3	https://www.youtube.com/watch?v=Eth8f4mnkns&list=PLwdnzlV3ogoU-zxx2wMFG_FSDsGKVQ93g&index=55
4	https://www.youtube.com/watch?v=ycebYdENspE&list=PLwdnzlV3ogoU-zxx2wMFG_FSDsGKVQ93g&index=60

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2												1	1
CO2		3		2									3	2
CO3						1	3							2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information	
Programme	B.Tech. (Civil Engineering)
Class, Semester	Second Year B. Tech., Sem. IV
Course Code	6CV223
Course Name	Structural Analysis
Desired Requisites:	Strength of Materials

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives	
1	To illustrate concepts of static and kinematic indeterminacy of structures.
2	To provide the knowledge of various methods to evaluate deformations of various structures.
3	To impart the knowledge for analyzing determinate and indeterminate structures by using various methods.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	**Perceive** and **Explain** various theories in Structural Analysis.	II	Understanding
CO2	**Solve** problems on slope and deflection of statically determinate and Indeterminate structures using different methods.	III	Applying
CO3	**Analyze** the behavior of statically determinate and Indeterminate structures using various methods.	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Slopes and Deflections of beams** Types of structures, Equilibrium and compatibility conditions, determinate and indeterminate structures, Static and kinematic degree of indeterminacy. Deflection of Beams: Computation of Slope and Deflections in Beams- Double Integration Method, Macaulay's method, Moment area method & Conjugate beam method.	7
II	**Energy Principles** Strain energy due to axial force, shear force, bending moment and torque. Strain energy and complimentary energy, Castigliano's Strain Energy theorems. Unit load method. Computation of deflections in determinate structures such as beams, bends, arches, trusses Betti's and Maxwell's reciprocal theorems.	6
III	**Influence Line Diagrams** Muller-Breslau's principle and its application to statically determinate simple and compound beams. Influence line diagrams for support reaction, shear force and bending moment, ILD for member forces in statically determinate trusses	6
IV	**Strain Energy Method** Analysis of indeterminate structures such as two hinged portal frames, Two hinged arches and indeterminate trusses, Effect of lack of fit, Temperature stresses	6

V	**Slope Deflection Method** Slope deflection equations, Sinking of supports, Application to beams andframes with and without sway, concept of Symmetry and anti- symmetry. **Moment Distribution Method** Carry over theorem, Distribution theorem, Relative and absolute stiffness, Distribution factors, Sinking of supports, Applications to beams, frames with and without sway.	8
VI	**Introduction to matrix methods for structural analysis** Flexibility and stiffness coefficients, development of flexibility and stiffness coefficient matrix, development of compatibility and equilibrium matrix equations, Applications to beams and frames (Degree of indeterminacy ≤ 2)	6

Textbooks	
1	Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill, 3rd Edition, 2011.
2	Devdas Menon, "Structural Analysis", Alpha Science Intl, Ltd., 2nd Edition, 2008.
3	Pandit & Gupta, "Structural Analysis - Matrix Approach", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 4th Edition, 2004.

References	
1	Hibbeler R. C., "Mechanics of Materials", Pearson Education, 10th Edition, 2016.
2	Weaver and Gere J. M., "Matrix Analysis of Framed Structures", CBS Publications and Distributors, 2nd Edition, 2004.
3	Wang C. K., "Indeterminate Structural Analysis", Tata McGraw-Hill Publishing CompanyLtd., New Delhi, 1st Edition, 1983.

Useful Links	
1	Mod-01 Lec-01 Review of Basic Structural Analysis I - YouTube
2	Lecture -1 Structural Analysis - YouTube
3	NPTEL :: Civil Engineering - Structural Analysis II
4	https://www.youtube.com/channel/UCeZaQte8MpBtv_0i1MspYUQ/

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1												2
CO2	3	3											3	3
CO3	3	3											3	2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISEshall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2023-24

Course Information	
Programme	B.Tech. (Civil Engineering)
Class, Semester	Second Year , IV
Course Code	6CV224
Course Name	Concrete Technology
Desired Requisites:	-

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives	
1	To impart conceptual knowledge of role played by cement, aggregates and admixtures required to produce quality concrete.
2	To make students conversant with fresh and hardened properties and durability issues of concrete.
3	To develop skills required to prepare and design concrete mixes.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Describe role of various ingredients in the preparation of quality concrete.	Understanding
CO2	Interpret properties of concrete in fresh and hardened state.	Applying
CO3	Illustrate mix design of concrete as per IS code.	Applying

Module	**Module Contents**	**Hours**
I	**Ingredient of Concrete:** **Cement:** Manufacturing of Portland cement, Chemical composition, Hydration of cement, Classification and types of cement, Tests on cement. **Aggregate:** Classification, Mechanical and Physical Properties, Grading of Aggregates, Tests on aggregate, Artificial and recycled aggregate. **Water -** Mixing Water, Curing water, tests on the water. **Admixtures:** Introduction to Mineral and chemical admixtures	8
II	**Concrete Manufacturing Process**: Mixing, Transportation, Placing, compaction and finishing.	6
III	**Properties of Fresh Concrete:** Workability: Factors affecting workability, measurement of workability Cohesion and segregation, bleeding, Setting of concrete. **Curing** - Methods of curing, influence of temperature, steam curing.	6
IV	**Concrete Mix Design** Factors to be considered, Concrete mix design for compressive strength by IS: 10262 (2019) method, Statistical quality control	7
V	**Properties of Hardened Concrete** Strength of concrete – General, factors affecting strength, Micro-cracking and stress-strain relation, Elasticity, tensile and flexural strength, Creep, and Shrinkage, Non-destructive testing of concrete Introduction to Durability issues.	7
VI	**Special Concretes**: High Strength Concrete, Self-Compacting Concrete, Dry Lean Concrete, Pavement Quality Concrete, (RPC)	6

Textbooks	
1	Shetty M. S., Concrete Technology, S. Chand & Company Ltd. New Delhi, 7th Edition, 2013.

2	Gambhir, M. L., Concrete Technology, Tata Mc Graw Hill Publishers, 2012.
3	Neville A. M. and Brooks J. J., Concrete Technology, Pearson Education Limited, 1987
References	
1	Neville A. M., "Properties of Concrete", Prentice Hall, 5th edition, 2012
2	Mehta P. K. and Paulo J. M. M, "Concrete – Microstructure, Properties and Material", McGraw Hill Professional 3rd Edition, 2009.
3	Newman J., Choo B.S., Advanced Concrete Technology-Constituent Materials, Elsevier Ltd. 1st edition, 2003
Useful Links	
1	https://www.digimat.in/nptel/courses/video/105102012/L01.html
2	https://www.digimat.in/nptel/courses/video/105104030/L01.html
3	https://www.digimat.in/nptel/courses/video/105106176/L01.html
4	https://www.digimat.in/nptel/courses/video/105102012/L01.html

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2												2	1
CO2		2											3	1
CO3			3										3	1

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of a teacher's assessment. The mode of assessment can be field visits, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed, and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information

Programme	B.Tech. (Civil Engineering)
Class, Semester	Second Year, IV Sem
Course Code	6CV271
Course Name	Hydraulics Laboratory
Desired Requisites:	Fluid Mechanics and Open Channel Hydraulics

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	0Hrs/ Week	30	30	40	100
		Credits: 2			

Course Objectives

1	To demonstrate behaviour of fluid flow through open channel using lab scale models.
2	To provide hands on experience to measure open channel flow by using different lab scale arrangements.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Conduct experiment on open channel flow to determine velocity and roughness coefficient.	Applying
CO2	Demonstrate the open channel flow and measuring devices.	Applying
CO3	Interpret and analyse data obtained through lab scale experiments performed on uniform and non-uniform flows.	Analysing

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Measurement of velocity for open channel flow by using pitot tube and current meter.
2. Determination of Manning's and Chezy's constant for open channel flow by using uniform flow formulae
3. Study of nappe profile over a sharp crested weir by providing with and without ventilation below the lower nappe.
4. Measurement of open channel flow by using
   i. Rectangular Notch
   ii. Triangular Notch
   iii. Broad Crested Weir.
   iv. Round Crested Weir.
   v. Venturi flume.
5. Develop specific energy and specific force diagrams of hydraulic jump in the open channel flow.
6. Develop the different type of hydraulic jumps in open channel flow and estimation of loss of energy.

Textbooks

1	Likhi, S.K., "Hydraulics: Laboratory Manual", New Age International Publishers, 1 st Edition, 1995.
2	Rangaraju K.G., "Flow in Open Channels", Tata McGraw Hill Publication Co. Ltd., New Delhi,1 st Edition, 1993.
3	Aswa G.L. "Experimental Fluid Mechanics", Vol. I&II, Nem Chand & Bros., Roorkee,1 st Edition,1983.

References

1	Modi and Seth., "Hydraulics and Fluid Mechanics", Standard Book House, 9 th Edition,2013.
2	Subramanya K., "Theory and Applications of Fluid Mechanics" Tata McGraw Hill Publishing Co., Ltd., 7th Edition2000.

3	VenTe Chow, “Open channel Hydraulics”, Tata McGraw Hill Publishing, 1st Edition,2000.

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1				3	1								1	1
CO2				2	1								1	1
CO3				3	1								1	1
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2, and Lab ESE IMP: Lab ESE is a separate head of passing. Lab ESE is treated as End Semester Exam and is based on all experiments/lab activities.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab Performance and documentation	Lab Course faculty	During Week 13 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.				

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Course Information	
Programme	B.Tech. (Civil Engineering)
Class, Semester	Second Year, IV
Course Code	6CV272
Course Name	Building Planning and Design – Mini Project
Desired Requisites:	Building Materials and Construction Course

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 hrs/week				
Interaction	-	**Credits: 1**			

Course Objectives	
1	Impart the approach to functionally plan and design a typical building by applying concepts of principal of planning and implementation of byelaws.
2	Generate necessary knowledge to apply the various building services viz. plumbing, electrification and furniture within the buildings.
3	Create awareness of aesthetics and architectural ornamentation in buildings through engineering drawings

Course Outcomes (CO)		
CO	Description	Blooms Taxonomy
CO1	**Illustrate** the requirements of residential/public building in terms of structural, functional, architectural aspects and **apply** the principles of planning, bye laws during planning process and designing buildings.	**Apply**
CO2	**Study and Integrate** different building services namely, water supply, drainage facilities and electrification services.	**Integrate**
CO3	Communicate and interact as a team to **apply** the drawing techniques and **compose** buildings using conventional and modern tools.	**Create**

List of Experiments / Lab Activities

List of Activities :

1. Forming groups of 4-5 students in each batch and allocating a type of building as a project work. An overall ideation of the various planning phases will be explained to the students.
2. For the type of building chosen, each group will visit 2-3 existing buildings and will present the development in planning for the given problem: Size & nature of plot, Soil conditions and gradient, Structural system, Requirements of the building, Drawings to be submitted, during the second week.
3. For the selected type of building, presentation on the following: Circulation diagram, grouping of various rooms, a tentative plan of the building based on principles of planning privacy, ventilation, lighting, sizes for comfort, openings.
4. The group will present scaled drawings on graph sheets about the Building Plan based on principles of planning and bye laws. Drawing sheets based on orientation of buildings, climate, Minimizing internal heat gain, Design of staircase.
5. The group will present the revised scaled drawings on Drawing sheets based on, Plumbing for water supply and drainage, Design of the plumbing system, Electrification, Location of Switchboards, min. no. of points, safety devices.
6. The various phases and improvements in of planning process will be a continuous activity and should lead to a final ideal plan for which detailed drawings are to be submitted as under:
   I. Municipal drawings- Plan, section and front elevation, site plan, area calculations and statement.
   II. Plans showing furniture and electrification details
   III. Plan showing water supply and plumbing layout, terrace slope and drainage, table of materials used.
7. 1 Students will have to draw the municipal drawing of their finalized building using AutoCAD and

attach its print along with the previous sheets as submission work	
Text Books	
1	Sikka V. B., Kataria S. K. and Sons, A Course in Civil Engineering Drawing - 7th Edition, 2015.
2	Kumarswamy N. and Kameshwar Rao A.., "Building Planning and Design," Chraotar Publishing House Pvy. Ltd., 8th edition, 2010.
3	National Building Code of India 2016, SP- 7, Bureau of Indian Stds. New Delhi, 2nd Edition.
References	
1	Pierce S Rowland, Planning: The Architect's Handbook "E. & OE" , Iliffe Books Ltd. London
2	Time saver's standard's of Architectural design data, Callender, Tata Mc Graw Hill Pub.
3	Agarwal S.C. Rai Dhanpat and Sons, Architecture and Town Planning –2013
Useful Links	
1	

CO-PO Mapping														
	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		2	3										2	
CO2			2				3						2	
CO3	2				2				1	1			2	
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2, and Lab ESE IMP: Lab ESE is a separate head of passing. Lab ESE is treated as End Semester Exam and is based on all experiments/lab activities.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab Performance and documentation	Lab Course faculty	During Week 13 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.				

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Course Information

Programme	B. Tech. (Civil Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	6CV273
Course Name	Advanced Surveying Lab
Desired Requisites:	Engineering Surveying and Engineering surveying Laboratory

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	1 Hrs/ Week	30	30	40	100
		Credits:1			

Course Objectives

1	To demonstrate advanced surveying techniques through field exercises.
2	To develop and retain a basic understanding of employing special functions of advanced survey Instruments for land Surveys.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Study digital level, digital theodolite, auto reduction tachometer and total station and apply appropriate surveying instruments for field exercise.	III	Applying
CO2	Demonstrate use of advanced instruments for topographic survey.	III	Applying

List of Experiments / Lab Activities/Topics

List of Experiments:

Part I: Field Exercises (inside the campus)

1. Levelling
- a. Study of Digital level
- b. Levelling exercises
- c. Digital data processing

2. Digital Theodolite
- a. Angle measurement and traversing
- b. Trigonometric levelling

3. Auto reduction Tacheometry
- a. Auto reduction tacheometry for length, gradient, and area determination

4. Study of Total Station
- a. Exercises based on various functions
- b. Digital data processing

Part II: Field Projects (outside the campus)

Road project including alignment, contouring, earthwork computations, drawing preparation etc. with relevant advanced instrument and software

Textbooks

1	Arora K. R. "Surveying", Vol. 1 & 2, Standard Book House, Kota 16th edition, 2018,. 2015.
2	Basak N. N., "Surveying and Levelling", Tata Mcgraw Hill Education Pvt. Ltd, New Delhi, 2nd Edition, 2017.
3	Punmia B. C. and Jain, "Surveying", Vol. 1, 2 & 3, Laxmi Publications, New Delhi. 17th edition,
4	

References	
1	Duggal S. K, “Surveying”, Tata Mcgraw Hill Education Pvt Ltd, 4th edition, Delhi, 2017.
2	Bannister and Raymond, “Surveying”, ELBS, Longman Group Ltd., England.
3	Davis R. E., F. Foote and J. Kelly, “Surveying; Theory and Practice”, McGraw Hill Book Company, New York.
4	

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1				3								3	2
CO2				2	3				2				3	2
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

Programme	B.Tech. (Civil Engineering)
Class, Semester	Second Year B. Tech., Sem VI
Course Code	6CV275
Course Name	Concrete Technology Lab
Desired Requisites:	Concrete Technology

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**Lab ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 hrs/week				
Interaction	-	**Credits: 1**			

Course Objectives

1	To make students familiar with basic test methods for evaluating properties of cement and concrete.
2	To develop ability to analyse test results for assessing the quality of material according to codal provisions.
3	To provide skills to determine fresh and hardened properties of concrete and assess concrete by non-destructive techniques.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Comprehend and Apply** test methods to assess the properties of cement and concrete.	Understand & Apply
CO2	**Decide** the quality of cement and concrete based on the analysis of test results.	Analyse
CO3	**Analyse** the concrete quality by non-destructive test methods.	Analyse

List of Experiments / Lab Activities

List of Experiments:

1. Consistency of cement
2. Initial and Final Setting time of Cement
3. Strength of Cement
4. Soundness of Cement
5. Gradation of fine aggregate and Coarse aggregate
6. Workability of concrete - Slump Cone and slump retention test
7. Compressive and Split tensile strength of concrete
8. Flexural Strength of Concrete
9. Rebound Hammer Test
10. Ultrasonic Pulse velocity test

Text Books

1	Mehta P. K. and Paulo J. M. M, "Concrete – Microstructure, Properties and Material", McGraw Hill Professional 3rd Edition, 2009.
2	Neville A. M. and Brooks J. J., "Concrete Technology", Pearson Education Limited, 1987
3	Shetty M. S., "Concrete Technology", S. Chand & Company Ltd. New Delhi, 7th Edition, 2013.

References

1	IS 4031 (1999). "Methods of physical tests for hydraulic cement" Bureau of Indian Standards (BIS), New Delhi, India.
2	IS 516 (1959). "Methods of tests for strength of concrete" Bureau of Indian Standards (BIS), New Delhi, India.

3	IS 13311 (1992). “Method of Non-destructive testing of concrete” Bureau of Indian Standards (BIS), New Delhi, India.
Useful Links	
1	https://www.digimat.in/nptel/courses/video/105106176/L01.html
2	
3	
4	

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1				3									1	
CO2				3		1	1						2	
CO3				3	3								2	
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2, and Lab ESE IMP: Lab ESE is a separate head of passing. Lab ESE is treated as End Semester Exam and is based on all experiments/lab activities.				
Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab Performance and documentation	Lab Course faculty	During Week 13 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.				

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Course Information	
Programme	B. Tech. (Civil Engineering)
Class, Semester	Second Year B. Tech., Semester IV
Course Code	6IC201
Course Name	Environmental Science
Desired Requisites:	Nil

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs./week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives	
1	Infuse an understanding of the various environmental concepts on scientific basis in the functional area of Engineering and technology.
2	Provide a foundation to critically assess the approaches to pollution control, environmental and resource management, sustainable development, cleaner technologies, Environmental Legislation based on an understanding of the fundamental, environmental dimensions.
3	Inculcate the modern concept of green industry and the impact of excess human population, globalization, and climate change on the environment.

Course Outcomes (CO)	
CO1	Describe key concepts of Environmental science and their relationship to engineering
CO2	Explain ethical and legal responsibility of an engineer and his role in effective implementation of sustainable activities through EIA and EMS in the corporate sector.
CO3	Predict impact of contemporary issues (Population Explosion, Climate change, Environmental pollution) on the environment

Module	**Module Contents**	**Hours**
I	**Environment, Ecology and Biodiversity** Introduction: Natural and Built Environment, Environmental education: definition, scope, objectives and importance, Components of the Environment: Atmosphere, Hydrosphere, Lithosphere and Biosphere. Ecology : Introduction, Types (terrestrial and aquatic ecosystems) , Structure and function, Trophic levels, Food chains, food webs, Ecological pyramids, Ecological succession, Biogeochemical cycles. Biological Diversity: Introduction, Value of biodiversity: consumptive use, Threats to biodiversity, Conservation of biodiversity.	7
II	**Human Population, Energy and Natural Resources** Human Population Growth and Environment: Population Dynamics, Age structures, Energy Scenario: Future projections of Energy Demand, Utilization of various Energy Sources, Conventional Energy Sources and Non- Conventional Energy Sources, Urban problems related to energy. Natural Resources: Food, Water, Forest, Geological, Equitable Use of Resources for Sustainable life style. Case studies.	5

III	**Climate Change, Environmental Quality and Pollution Control** Climate change: Global warming, Ozone depletion, Acid Rain. Environmental Impact: Impact of Modern agriculture on the Environment, Impact of Mining on the Environment, Impact of Large dams on the Environment, Environmental pollution: Air, Water, Soil, Noise, Marine, classification of pollutants, their causes, effects and control measures. Case studies.	5
IV	**Solid, Hazardous Waste and Disaster Management** Solid and Hazardous waste management: Introduction, categories, causes, effects and management of municipal solid waste, Hazardous waste Disaster Management: Introduction, types of disasters, Disaster mitigation. Case studies.	4
V	**Social Issues, Environmental Management and Legislation** Environmental ethics: Introduction, Ethical responsibility, issues and possible solutions. Environmental Management: Introduction to Environmental Impact Assessment, Environmental Management System: ISO 14001Standard, Environmental Auditing, National and International Environmental protection Agencies pertaining to Environmental Protection. Environmental Legislation: Environmental protection act 1986, Water (prevention and control of pollution) Act 1974, Air (prevention and control of pollution) Act 1981, Wild life Protection Act 1972, and Forest Conservation Act 1980. Municipal Solid Wastes (Management and Handling) Rules, 2000.	4
VI	**Cleaner technology** Restoration Ecology, Role of Information Technology in Environment science, Green buildings, Green products, Consumerism and Waste Products, Minimization of Hazardous Products, Reuse of Waste, By-products, Rainwater Harvesting, Translocation of trees. Some Success Stories. Case studies	3

Text Books	
1	Mrinalini Pande, “Disaster Management”, Wiley Publications New Delhi, First edition, 2014
2	N.K Uberoi, “Environmental Studies”, Excel Books Publications New Delhi, first edition, 2005.
3	R.Rajagopalan, “Environmental Studies from crisis to cure” Oxford university press, second edition, 2011

References	
1	William. Cunningham and Barbara Woodworth Saigo, “Environmental Science: A Global Concern”, WCB/McGraw Hill publication, 5th Edition, 1999.
2	Peter. H. Raven, Linda. R. Berg, George. B. Johnson, “Environment”, McGraw Hill publication, 2nd -Edition, 1998.
3	Catherine Allan & George H. Stanley (Editors), “Adaptive Environmental Management”, Springer Publications. 2009

CO-PO Mapping														
	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1						2	2							
CO2							3	2						
CO3							2							