Semester -I

Walchand College of Engineering, Sangli
(Government Aided Autonomous Institute)

AY 2026-27 onward

Course Information

Programme	B. Tech.
Class, Semester	First Year (Civil) Semester I
Course Code	8BS101
Course Name	Linear Algebra, Calculus and Differential equations
Desired Requisites:	Mathematics course at Higher Secondary Level

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	1 Hr/week	30	20	50	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	Understand foundational matrix algebra for engineering applications.
2	Apply differential and integral calculus to engineering problems.
3	Solve analytical differential equations used in engineering problems.
4	Learn numerical methods to simulate simple systems.

Course Outcomes (CO)

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	**Understand** the concepts of Linear Algebra to describe linear systems.	II	Understand
CO2	**Understand** the mathematical properties of improper integrals and Beta-Gamma functions	II	Understand
CO3	**Apply** analytical and numerical Methods to solve Ordinary Differential Equations	III	Apply
CO4	**Apply** partial differentiation approximations and system optimization points**.**	III	Apply

Module	**Module Contents**	**Hours**
I	**Linear algebra** Matrices and Rank, system of Linear equations, Gauss elimination method, Eigen value and Eigen vector, Cayley Hamilton Theorem.	5
II	**Differential Calculus** Taylor Series for single variable, Partial derivative, error and approximations, maxima and minima.	4
III	**Integral Calculus** Introduction, Improper integral, Gamma function and its properties, Beta function and its properties.	5
IV	**Differential equation of first order and first degree** Introduction, Exact Differential equation, Non exact Differential equation, Linear Differential equation and Bernoulli's Differential equation.	5
V	**Numerical solutions to ordinary differential equation** Introduction, Euler's Method, Modified Euler's method, Runge Kutta 4^{th} order method.	4
VI	**Linear Differential Equations** Introduction, Complimentary function, particular integral for exponential function, trigonometric function, polynomial and arbitrary function, Applications to Civil Engineering.	5

Text Books	
1	B. V. Ramana, Higher Engineering Mathematics, The McGraw Hill companies, 2006.
2	H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 1st Edition, 2014.
3	Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition
References	
1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., 10th Edition, 2015.
2	R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 5th Edition, 2016.
3	George B. Thomas, Maurice D. Weir, and Joel Hass, Thomas' Calculus, Pearson Education, 14th Edition, 2018.
4	S. S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5th Edition, 2012.
5	Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 5th Edition, 2018.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_ma37/preview
2	https://onlinecourses.nptel.ac.in/noc22_ma75/preview
3	https://onlinecourses.nptel.ac.in/noc19_ma28/preview

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2
CO1	3	2	—	—	—	—	—	—	—	—	—	—	—
CO2	3	3	—	—	—	—	—	—	—	—	—	—	—
CO3	3	3	—	—	—	—	—	—	—	—	—	—	—
CO4	3	3	—	—	—	—	—	—	—	—	—	—	—

The strength of mapping: - 1: Low, 2: Medium, 3: High

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 25-30% weightage on modules 1 to 3 and 70-75% 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).

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

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AY 2026-27 Onwards

Course Information	
Programme	B.Tech. (Civil and Mechanical Engineering)
Class, Semester	First Year B. Tech., Sem I/II
Course Code	8BS102
Course Name	Engineering Mechanics
Desired Requisites:	Physics, Mathematics

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 knowledge on fundamentals of mechanics
2	To provide knowledge of basic concepts and system of forces in statics and dynamics
3	To illustrate the principles of mechanics in engineering applications

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	Explain concept & principles of forces with respect to engineering applications	II	Understanding
CO2	Apply the concepts of force, stresses and strains for analysis of trusses and solid bodies	III	Applying
CO3	Apply the concepts of Newton's laws of motion, D'Alemberts principles to solve problems related to dynamic system	III	Applying

Module	Module Contents	Hours
I	**Forces** Fundamentals, Systems, Composition and Resolution, Resultant of planar force systems. Free Body Diagram, Laws of Forces, Varignon's Theorem, Lami's Theorem	8
II	**Equilibrium** Equilibrium conditions, Concept of determinacy and indeterminacy Beams: Types of Supports, Loads and Reactions Principle of Virtual Work and its applications to statically determinate beams	7
III	**Centroid and Moment of Inertia** Centre of gravity and Centroid, Moment of Inertia of Plane figure, Composite Sections, Radius of gyration, Mass-Moment of Inertia	5
IV	**Plane Trusses** Pin-jointed statically determinate plane trusses: Assumptions, imperfect, perfect and redundant trusses, Analysis by Method of joints, method of sections	5
V	**Concept of Stress and Strain:** Normal and shear stress and strain, State of stress at a point, Stress strain curve, Hook's law, Modulus of elasticity, Poisson's ratio, Modulus of rigidity, Bulk modulus	8

VI	**Dynamics of Particles:** Rectilinear Motion, Motion of Projectile, Kinetics – Newton's laws of motion, D'Alemberts principle, Applications to rough inclined plane, lift, and connected bodies, Collisions: Impact, Collision of bodies, Coefficient of Restitution, Loss of Kinetic Energy due to Impact	7

Textbooks	
1	Ramamrutham., S. "Textbook of Applied Mechanics", Dhanpat Rai Publishing Company Limited, 2008.
2	Bhavikatti., S. S. and Rajashekarappa., K. G. "Engineering Mechanics", New Age International Publishers, 2015, 5th Edition.
3	Beer, F. P. and Johnston, E. R. "Vector Mechanics for Engineers Vol. I and II", McGraw Hill Company Publication, 2011, 9th Edition.

References	
1	Singer, F. L. "Engineering Mechanics Statics & Dynamics", B. S. Publications, 2011.
2	Timoshenko, S. and Young, D. H. "Engineering Mechanics", McGraw Hill Companies, 2008, 4th Edition.
3	Meriam, L. and L.G. Kraige, "Engineering Mechanics – Dynamics", John Wiley & Sons, 2002, 6th Edition.
4	F. P. Beer and E. R. Johnston, Mechanics of materials, McGraw-Hill International

Useful Links	
1	https://nptel.ac.in/courses/112106286
2	https://www.youtube.com/watch?v=9Yt3I4bP-90

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2	3	1												
CO3	3	1												
CO4														

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)

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

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AY 2026-27 Onwards

Course Information

Programme	B.Tech. Civil
Class, Semester	First Year B. Tech.
Course Code	8ES101
Course Name	Engineering Graphics and CAD
Desired Requisites	Basic Knowledge of Different Types of Curves

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2Hrs/week	**MSE**	**ISE/LA**	**ESE**	**Total**
Tutorial	-	20	30	50	100
Lab	2 Hrs/week	**Credits: 3**			

Course Objectives

1	Introduce students to the conventions, concepts and basic principles of Engineering Drawing.
2	Draw projections of geometrical objects and real life components.
3	Demonstrate graphics skill for communication of concepts, ideas and design of engineering products

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	Demonstrating Principles of Engineering, Computer Graphics through drafting software	I	Demonstrating
CO2	Understanding Principles of Engineering Graphics	II	Understanding
CO3	Outline projection of engineering objects	III	Applying
CO4	Correlating the knowledge of engineering graphics in real life applications.	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Engineering Graphics Fundamentals:** Importance of engineering graphics in civil engineering, graphical communication, BIS standards and conventions, drawing instruments and their uses, types of lines, lettering techniques, dimensioning principles and methods. **Scales:** Representative Fraction (RF), Plain Scale, Diagonal Scale, Vernier Scale and their applications in civil engineering drawings. **Conic Sections:** Construction of Ellipse, Parabola, and Rectangular Hyperbola by different methods.	4
II	**Orthographic Projection:** Principles, reference planes, quadrants, projection system and conventions. Projection of Points: Points located in different quadrants. **Projection of Straight Lines**: Lines parallel, perpendicular, and inclined to HP and VP; determination of true length and true inclinations. Special Cases: Parallel, intersecting, and skew lines. **Auxiliary Projections**: Auxiliary planes, auxiliary views, and determination of true dimensions using auxiliary projection methods.	5
III	**Projection of Plane Surfaces:** Projection of regular polygons and circular laminae positioned parallel, perpendicular, and inclined to reference planes. **Inclined Planes**: Planes inclined to HP, VP, and both HP and VP. **Auxiliary Views**: Use of auxiliary planes for obtaining true shape and size of inclined plane surfaces. Applications in civil engineering drawings and layouts.	4
IV	**Projection of Solids:** Orthographic projection of prisms, pyramids, cylinders, cones, and combinations of solids. **Inclined Solids**: Solids resting on HP, VP, or inclined to one or both reference planes. **Section of Solids**: Sectioning by	5

	auxiliary planes, sectional views, apparent and true shape of sections. **Development of Surfaces**: Development of lateral surfaces of prisms, pyramids, cylinders, and cones with applications in fabrication, ducts, tanks, and sheet-metal work.	
V	**Building Drawing Fundamentals:** Conventional symbols, signs, and line conventions used in civil engineering and architectural drawings. **Building Planning:** Preparation and interpretation of building plans, elevations, and sectional views. **Building Components:** Representation of foundations, walls, doors, windows, staircases, roofs, lintels, and sanitary fixtures. **Perspective Drawing:** One-point and two-point perspective views of simple buildings and civil engineering structures. Reading and interpretation of civil engineering drawings.	4
VI	**Introduction to CAD:** Advantages and applications of CAD in civil engineering. Introduction to AutoCAD interface and workspace. **Drawing Setup:** Units, limits, coordinate systems, layers, object snaps, grids, and drawing aids. **Drawing Commands:** Line, Polyline, Circle, Arc, Rectangle, Polygon, Ellipse, Hatch, and Text commands. **Modification Commands:** Move, Copy, Rotate, Mirror, Scale, Offset, Trim, Extend, Fillet, and Chamfer. **Annotation:** Dimensioning, text styles, leaders, and symbols. **Civil Engineering Applications:** Preparation of building plans, elevations, sections, site layouts, and perspective views using AutoCAD. **Output Generation:** Layout creation, plotting, printing, and export of engineering drawings.	4

List of Experiments / Lab Activities

Exp. No.	Title of Experiment	Content / Scope
1	Introduction to Engineering Graphics and AutoCAD Environment	Familiarization with drawing instruments, BIS standards, AutoCAD interface, drawing setup, coordinate systems, units, layers, object snaps, and file management.
2	Construction of Scales and Conic Sections	Preparation of Plain, Diagonal, and Vernier Scales; drawing of Ellipse, Parabola, and Rectangular Hyperbola using CAD.
3	Projection of Points and Straight Lines	Orthographic projection of points and lines inclined to HP and VP; determination of true length and true inclination.
4	Projection of Plane Surfaces and Solids	Projection of plane surfaces, prisms, pyramids, cylinders, and cones in different positions with respect to HP and VP.
5	Sections and Development of Solids	Sectional views, true shape of sections, and development of surfaces of prisms, pyramids, cylinders, and cones.
6	AutoCAD Drawing and Modification Commands	Practice of drawing and editing commands including Line, Circle, Arc, Move, Copy, Rotate, Mirror, Trim, Extend, Offset, Fillet, and Chamfer.
7	Building Drawing using AutoCAD	Preparation of residential building plans showing walls, doors, windows, dimensions, symbols, and annotations as per civil engineering standards.
8	Building Elevation, Section and Plotting	Preparation of building elevations and sections; dimensioning, annotation, layout creation, plotting, and printing of drawings.
9	Perspective Drawing using AutoCAD	reparation of one-point and two-point perspective views of simple engineering objects using AutoCAD.

10	Perspective Drawing of Civil Engineering Structures using AutoCAD	Preparation of perspective views of simple residential buildings and civil engineering structures using AutoCAD.

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able to:

The student will learn :

- Introduction to engineering drawing and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics projection of standard solid primitives
- Exposure to visualization of 3-D solid modeling
- Exposure to computer-aided geometric drafting
- Exposure to creating working drawings

Text Books	
1	Bhatt N.D., Panchal V.M. and Ingle P.R., Engineering Drawing, Charotar Publishing House, 2014.
2	Shah, M.B. and Rana B.C., Engineering Drawing and Computer Graphics, Pearson Education, 2008.
3	Agrawal B. and Agrawal C. M., Engineering Graphics, TMH Publication, 2012.

References	
1	Narayana, K.L. and P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2008.
2	Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi, 2010
3	Fredderock E. Giesecke, Alva Mitchell others, Principles of Engineering Graphics, Maxwell McMillan Publishing, 2010

Useful Links	
1	https://nptel.ac.in/courses/112/103/112103019/
2	https://nptel.ac.in/courses/105/104/105104148/
3	https://www.youtube.com/watch?v=xXdpkQXDuMw&list=PL9RcWoqXmzaJT-fliqTSwUjWU4zCX_H2A

CO-PO Mapping For Robotics and Automation															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3				2					1		1	2		
CO2			2										1		
CO3					3					1			2		
CO4												3	1		
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Assessment
The assessment is based on MSE, ISE/LA and ESE. MSE shall be typically on modules 1 to 3. ISE/LA shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be lab work, assignment, orals 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/LA+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information	
Programme	B.Tech. (Civil Engineering)
Class, Semester	First Year, Semester I/II
Course Code	8ES152
Course Name	Programming and Spreadsheets
Desired Requisites:	Basic computer knowledge

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

Course Objectives	
1	Utilize spreadsheet tools for data analysis and visualization
2	Apply spreadsheet and python functions to solve basic civil engineering problems.

Course Outcomes (CO)

	At the end of the course student should be able to:		
CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	***Demonstrate*** the use of different function in MS excel and python for the Civil Engineering data analysis	Understand Apply	II III
CO2	***Create*** the graphs, charts and Pivot tables for the data using MS excel and python programming.	Create	VI
CO3	***Analyze*** the Civil Engineering data using the MS excel capabilities as well as python programming.	Analyze	IV
CO4	***Create*** the dashboard for demonstrating the use of MS excel and python in Civil Engineering data analysis	Create	VI

Module	**Module Contents**	**Hours**
I	**Computational Tools for Civil Engineering** Role of computational tools in Civil Engineering, Introduction to Spreadsheet Applications and Python Engineering data representation, Data entry, formatting, and worksheet management Python environment and basic input/output operations	2
II	**Engineering Calculations and Data Processing** Variables and arithmetic operations, Spreadsheet formulas and cell references, Built-in spreadsheet functions, Engineering computations using computational tools	2
III	**Decision Making and Validation of Engineering Data** Conditional statements, Logical operators, Data validation techniques, Error identification and correction	2
IV	**Data Analysis of Civil Engineering Measurements** Repetitive computations using loops, Sorting and filtering datasets, Descriptive statistics, Data organization techniques	2
V	**Visualization and Reporting of Engineering Data** Charts and graphs, Trend analysis, Pivot tables and summary reports, Dashboard creation	3
VI	**Automation and Integrated Civil Engineering Applications** Reading and writing CSV data files, Automated processing of engineering datasets, Integration of calculations, analysis, and reporting	2

List of Experiments / Lab Activities
1. Preparation of a survey sheet with proper formatting and calculations. 2. Area, perimeter, and volume calculations for building elements. 3. Earthwork quantity estimation using spreadsheet formulas. 4. Concrete mix proportion calculations and material quantity estimation. 5. Concrete cube strength analysis and grading using conditional statements. 6. Water quality data analysis and validation. 7. Traffic volume data analysis using sorting, filtering, and statistical measures. 8. Rainfall data analysis and monthly trend identification. 9. Preparation of charts and graphs for traffic, rainfall, or laboratory datasets. 10. Material inventory management and consumption tracking. 11. Preparation of summary reports and dashboards using Pivot Tables. 12. Mini Project Any one of the following: a. Construction Material Cost Estimator b. Building Quantity Estimation Tool c. Rainfall Data Analysis System d. Traffic Survey Data Analyzer e. Concrete Strength Monitoring System f. Water Demand Estimation Calculator g. Construction Resource Tracking System

Text Books	
1	"Excel for Engineers and Scientists" by Sylvan Charles Bloch
References	
1	"Engineering Computations: An Introduction Using MATLAB and Excel" by Joseph Musto, William Howard, Richard Williams
2	Microsoft Excel Data Analysis and Business Modeling" by Wayne L. Winston
Useful Links	
1	https://www.udemy.com/course/100-days-of-code/
2	https://www.udemy.com/course/spreadsheet-excel-google-sheet/?couponCode=KEEPLEARNING

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1					3									
CO2					3					3				
CO3	1	1			3									
CO4	2	2			3					3				
The strength of mapping: 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. 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 the starting week of a semester. The actual schedule shall be as per the academic calendar. Lab activities/Lab performance shall include performing experiments, mini-projects, 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.				

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Ms. Nandinee Mudegol &

Mr. B. R. Kavathekar

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information					
Programme	B. Tech. (Civil Engineering)				
Class, Semester	First Year B.Tech., Semester- I				
Course Code	8ES102				
Course Name	(Program Core) Electro Mechanical Systems in Construction				
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	To introduce students the concepts of mechanical and electrical engineering related to construction
2	To provide students with necessary skills for the design of various electromechanical systems
3	To explain students concepts of building automation, energy conversion, mechanical systems in construction

Course Outcomes (CO)

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	Explain the construction, operation, and characteristics of electrical machines and transformers.	Understand	II
CO2	Explain low-voltage electrical installations, wiring systems and Earthing.	Understand, Analyze,	II,III
CO3	Explain the basic principles of fluid, hydraulic, pneumatic, and thermodynamic systems used in construction.	Understand	II
CO4	Demonstrate the operation and applications of HVAC, power transmission systems and safety systems used in construction and buildings.	Apply	IV

Module	**Module Contents**	**Hours**
I	**Basics of electrical Systems:** Ohm's law, single phase and three phase connections, AC, DC currents and its basics, Kirchhoff's Current Law , resistances in parallel and in series. **Building Power Distribution:** Switch fuse unit, MCB, Types of wire and cables. Staircase, for industrial and domestic buildings, Earthing. **Lighting Systems:** Illumination design, emergency lighting, and energy-efficient fixtures. Backup Power **Protection:** Design and sizing of standby generators, uninterruptible power supplies (UPS).	7
II	**Building Automation & Smart Systems:** **Control Systems:** Principles of sensors, actuators, and transducers (e.g., thermostats, pressure sensors). **Building Management Systems:** Building automation, electrical load calculation, cable size, electrical energy calculation, Billing, Tariff, load factor, load curve, Solar system for building, introduction to PCBs for various domestic applications	6

III	**Energy Conversion:** Construction, working principle and types of DC motor, AC motor, Applications of motors, Transformer, working and application of stepper, servo and universal motors. **Circulation Systems:** Principles, components, working and maintenance of: Elevators, Escalators, Conveyors. **Hydro-electric power project:** Mechanical, Electrical and instrumentation of typical hydro-electric power plant	7
IV	**Fundamentals of Mechanical Systems:** **Fluid Mechanics & Hydraulics** Basic fluid statics and fluid properties, Pascal's law and its engineering applications, Fluid kinematics and dynamics applied to water supply systems, Basic concepts of pressure, flow rate and head, Introduction to pumps used in buildings (centrifugal and submersible pumps) **Hydraulic and Pneumatic Systems in Construction** Hydraulic and Pneumatic system (Basic Principle, components), Applications in construction equipment such as excavators, backhoe loaders, cranes, concrete pumps and pneumatic breakers.	7
V	**HVAC & Environmental Systems**: Introduction to refrigeration and air-conditioning cycle, Basic concepts of heat transfer in buildings, Heating and cooling load calculations, Types of air-conditioning system, Indoor thermal comfort, Types of chillers and cooling towers, Refrigerant piping and chilled water networks. Ventilation requirements and standards, Air distribution, duct sizing and fan laws **Energy-Efficient Buildings** Introduction to green buildings and Energy-efficient HVAC concepts.	7
VI	**Power Transmission Systems for Construction Machinery** Basics of power transmission and transmission paths in construction machinery. Transmission components: shafts, couplings, belts, chains, gears, clutches, gearboxes, pumps, and actuators. Applications in excavators, bulldozers, cranes, loaders, mixers, and material handling equipment. Safety, maintenance, fault identification, and safe operation of transmission systems.	6

Text Books	
1	M.P. Poonia, S.C. Sharma, (2025). "Basic Mechanical Engineering", Khanna Publishing House, India
2	R. K. Rajput, **A Textbook of Mechanical Engineering**, Laxmi Publications.
3	V. K. Mehta, Rohit Mehta (2025). Basic Electrical Engineering, S. Chand Publications, India.
References	
1	ISHRAE Handbook of Air Conditioning and Refrigeration (latest edition).
2	P. N. Ananthanarayanan, **Basic Mechanical Engineering**, McGraw Hill Education.
Useful Links	
1	ISHRAE (HVAC and Building Services)

CO-PO Mapping

	Programme Outcomes (PO)											PSPO	
COs	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	**3**												
CO2		**3**										**3**	**3**
CO3			3									**3**	**3**
CO4													

The strength of mapping: - 1: Low, 2: Medium, 3: High

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 25-30% weightage on modules 1 to 3 and 70-75% 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)

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

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AY 2026-27 onwards

Course Information

Program		B. Tech. (Civil Engineering)			
Class, Semester		First Year B.Tech., Semester- I			
Course Code		8CV101			
Course Name		Built Environment Systems and Materials			
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 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 behaviour of the building as a whole.
3	Establish the representation of building components in terms of sketches and drawings

Course Outcomes (CO)

At the end of the course student should be able to:

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	Distinguish the strengths and weaknesses of various building materials by assessment and comparison of quality parameters as per IS codes.	Understand	II
CO2	Classify the various components and their relationships in buildings with different structural systems.	Understand	II
CO3	Interpret applications of various materials in building components in the context of strength and durability parameters.	Apply	III
CO4	Assign the materials and construction techniques to be adopted based on different structural systems.	Apply	III
CO5	Illustrate the various building components in terms of scaled engineering drawings.	Apply	III

Module	Module Contents	Hours
I	**Introduction to Civil Engineering and Building Systems:** Scope of civil engineering, Disciplines of civil engineering: Structural, Geotechnical, Transportation, Environmental, Construction Management, Surveying & Geomatics, Urban Planning, Water Resources Engineering. Role of Civil Engineers in infrastructure development, The need for buildings, Structural systems; Load bearing, Framed, Prefabrication, Pre Engineered Construction, Types of Loads on Building, Buildings Components and their functions, Stresses in Building Components, General properties of materials and their role in Construction, Sustainability in Construction.	7
II	**Building Materials – Properties and Applications:** General properties of materials, Origin, types, Qualitative parameters, Engineering properties and Applications of important building materials; Stone, Brick, Lime, Cement, Mortar, Steel, Specifications as per IS codes. Embodied Energy of Building Materials: Concept of embodied energy, life-cycle energy consumption of building materials, initial, recurring and end-of-life energy, and its role in sustainable material selection.	8

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, Brick masonry bonds, Concrete Block masonry, Cavity walls, Function and types of columns.	6
IV	**Openings in Buildings:** Physical and Functional roles of Openings, Materials Involved, Criteria for sizes of Openings, Functional types of Doors, Windows, Ventilators. Openings vs. Internal Comfort, Role of Lintel and Chajja. Staircases- Ideal Characteristics, types, Functional Design criteria	6
V	**Roofs and Floors:** Definitions, Accessible and Inaccessible roofs, Structural and functional requirements, Load considerations, Types of Sloped roofs, Roof covering materials, Types of Flat roof/floor, Types of RC slabs, Role of concrete and steel reinforcement, Formwork, Joints in construction.	6
VI	**Building Services and Finishes:** Types and requirements of Building Services, Plumbing for water supply and sanitation, Electrification. Types of Finishes for Wall, Floor, Roof, Ceilings. Types of Paints and their applications, Defects in finishes.	6

Text Books	
1	R. K. Rajput. “Engineering Materials”, S. Chand Publications, New Delhi, Edition 2014.
2	S.K.Duggal “Building Materials”, New Age International, 3rd Edition, 2008.
3	B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, “Building Construction”, Laxmi publications, New Delhi, 5th Edition, 2005.

References	
1	S.P. Arora and S.P. Bindra, “Building Construction", Dhanpat Rai and Sons, Edition 2014
2	Sandeep Mantri, “The A to Z of Practical Building Construction and its Management” Satya Prakashan, New Delhi, 2014
3	IS codes: IS 3495, IS 1077, IS 383, IS 4031

Useful Links	
1	https://www.youtube.com/playlist?list=PLLy_2iUCG87CfjAcR9lGNrJ16Fe6OqXzr
2	https://www.youtube.com/watch?v=Fp-KRz_fNSc&t=1s

CO-WK Mapping									
	Knowledge and Attributes (WK)								
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
CO1	2		3	2	1	2	2	1	
CO2			3	2		2			
CO3	2		2	2	2	2	2	1	1
CO4	1		2	2	2	2	2	3	1
CO5			2	2					
The strength of mapping: - 1: Low, 2: Medium, 3: High									

-PO Mapping													
	Programme Outcomes (PO)											PSPO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**
WK	1,2,3,4	1,2,3,4	3,4,5	8	2,6	1,5,7	9				8	1,2,3,4	1,2,3,4
COs													
CO1	3	3	3	1	2	2			1		1	3	3
CO2	3	3	3		2				1			3	3
CO3	2	2	2	1	2	2	1		1		1	2	2
CO4	2	2	3	3	2	2	1		1		3	2	2
CO5	2	2	2						1			2	2
The strength of mapping: - 1: Low, 2: Medium, 3: High													

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 25-30% weightage on modules 1 to 3 and 70-75% 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)

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27 onwards

Course Information

Program		B. Tech. (Civil Engineering)			
Class, Semester		First Year B.Tech., Semester- I			
Course Code		8VS151			
Course Name		Construction Material Testing 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	To provide practical knowledge of the properties, testing procedures, and quality assessment of commonly used building materials through field and laboratory investigations.
2	To develop understanding of construction practices, material selection, cost evaluation, and sustainable utilization of construction materials through site visits, surveys, and case studies.

Course Outcomes (CO)

At the end of the course student should be able to:

CO	At the end of the course student should be able to:	Blooms Taxonomy	
		Descriptor	Level
CO1	Perform field and laboratory tests on cement, bricks, blocks, and paving blocks and interpret the results as per relevant Indian Standards.	Apply	III
CO2	Demonstrate basic masonry construction practices and identify construction details through site visits and field observations.	Apply	III
CO3	Evaluate the physical and mechanical properties of building materials for their suitability in construction applications.	Analyze	IV
CO4	Analyze the cost, sustainability, and reuse potential of construction materials through market surveys and case studies.	Analyze	IV

List of Experiments/ Lab Activities/ Topics/ Field Visits

List of Experiments:

1. Report and presentation on modern construction project.
2. Field Tests on Cement (Colour test, Feel test, Presence of lumps, Float test, Prepare observation report)
3. Field Tests on Bricks (Soundness test, Hardness test, Structure test, Drop test)
4. Determination of compressive strength and water Absorption of Bricks/Blocks as per IS 3495 (Part I and II)
5. Determination of Degree of Efflorescence in Bricks as per IS 3495 (Part III)
6. Determination of compressive strength of the paving block.
7. Determination of Bulking of Sand and silt content.
8. Site Visit – Foundation Construction.
9. Site Visit – Masonry Construction.
10. Site Visit to a Local Building to observe Plumbing Details.
11. Market Survey and Comparative Cost analysis of Building Materials Used – A self study.

Text Books	
1	Duggal S. K, “Building Materials”, New Age International Publishers, 5th Edition, 2023
2	Punmia B.C., Jain A. K., “Building Construction”, Laxmi Publications, 11th Edition, 2019.
3	G.C. Sahu, Joygopal Jena. “Building Materials and Construction”, McGraw Hill Education, 2nd Edition, 2018.
References	
1	Gambhir M. L., “Civil Engineering Materials”, Tata McGraw Hill Education, 2nd Edition, 2011.
2	Varghese P. C., “Building Materials”, PHI Learning, 2nd Edition, 2015.
3	Jagadish K.S., B.V. Venkatarama Reddy, K.S. Nanjunda Rao., “Alternative Building Materials and Technologies”, New Age International Publishers, 2nd Edition, 2007.
4	Anil Kumar, Kataria S. K., “Building Materials: Products, Properties and Systems”, Oxford University Press India, 1st Edition, 2017.
Useful Links	
1	https://www.vlab.co.in/broad-area-civil-engineering

CO-WK Mapping									
	Knowledge and Attributes (WK)								
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
CO1	3	3		2	3				
CO2	2	2		2	2				
CO3	3	3	2	2	2		1		
CO4	2	2		2			3	1	
The strength of mapping: - 1: Low, 2: Medium, 3: High									

CO-PO Mapping													
	Programme Outcomes (PO)											PSPO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**
WK	1,2,3,4	1,2,3,4	3,4,5	8	2,6	1,5,7	9				8	1,2,3,4	1,2,3,4
COs													
CO1	3	3	3		3	3			2			3	3
CO2	2	2	2		2	2			2			2	2
CO3	3	3	2		3	3			2			3	3
CO4	2	2	2	1	2	3			2		1	2	2
The strength of mapping: - 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 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, attendance, journal	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Note:- 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.

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Semester II

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27 onward

Course Information

Programme	B. Tech.
Class, Semester	First Year (Civil) Semester I
Course Code	8BS103
Course Name	Vector Calculus, Statistics and Probability
Desired Requisites:	Mathematics course at Higher Secondary Level

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	1 Hr/week	30	20	50	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	To introduce double and triple integration for spatial analysis.
2	To learn vector fields, derivatives, and integral theorems.
3	To understand descriptive statistics and data visualization methods.
4	To explain probability distributions and curve fitting techniques.

Course Outcomes (CO)

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	**Understand** multi-dimensional integration and its geometric interpretation.	II	Understand
CO2	**Understand** basic statistical metrics and fundamental probability distributions.	II	Understand
CO3	**Apply** vector calculus theorems to fluid and structural problems.	III	Apply
CO4	**Apply** curve fitting and regression to predict material behaviour.	III	Apply

Module	**Module Contents**	**Hours**
I	**Multiple integral** Double integral, triple integral, Change of order of integration, integration over the area.	5
II	**Vector Differentiation** Velocity and acceleration, directional derivative, gradient, divergence, Curl of vector function.	4
III	**Vector integration** Work done, Line integral, surface integral, Green's theorem, Stoke's theorem, Gauss divergence Theorem.	5
IV	**Descriptive Statistics** Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent, Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability.	5
V	**Probability** Continuous and discrete random variable, probability mass function, probability density function, Binomial distribution, Poisson distribution, Gaussian Distribution, Exponential distribution.	5
VI	**Curve Fitting** Correlation and Covariance, Karl Pearson correlation coefficient. Linear Regression, regression coefficients, Regression lines, Second degree curve, Exponential curve.	4

Text Books

1	B. V. Ramana, Higher Engineering Mathematics, The McGraw Hill companies, 2006.
2	H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 1st Edition, 2014.

3	Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition
References	
1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., 10th Edition, 2015.
2	R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 5th Edition, 2016.
3	George B. Thomas, Maurice D. Weir, and Joel Hass, Thomas' Calculus, Pearson Education, 14th Edition, 2018.
4	Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Academic Press, 6th Edition, 2020.
5	Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 5th Edition, 2018.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_ma75/preview
2	https://onlinecourses.nptel.ac.in/noc21_ma74/preview
3	https://onlinecourses.nptel.ac.in/noc23_mg51/preview

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO 11**	**PSO1**	**PSO2**
CO1	3	1	—	—	—	—	—	—	—	—	—	—	—
CO2	3	2	—	—	—	—	—	—	—	—	—	—	—
CO3	3	3	—	—	—	—	—	—	—	—	—	—	—
CO4	3	3	—	—	—	—	—	—	—	—	—	—	—

The strength of mapping: - 1: Low, 2: Medium, 3: High

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 25-30% weightage on modules 1 to 3 and 70-75% 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).

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

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AY 2026-27 onwards

Course Information

Program	B. Tech. (Civil Engineering)
Class, Semester	First Year B.Tech., Semester- II
Course Code	8CV102
Course Name	Program Core - Geomatics
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	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 a logical manner and will be able to apply well understood principles in planning and design of engineering structures on the Earth's surface.

Course Outcomes (CO)

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

CO	Descriptor	Blooms Taxonomy	
		Descriptor	Level
CO1	Identify Surveying techniques to work in a team to collect the topographical data with due consideration to errors and blunders.	Remember	I
CO2	Perceive modern surveying equipment and techniques for land surveying.	Remember	II
CO3	Apply their knowledge to evaluate alternate surveying techniques suitable for the scope of the project and site situation.	Apply	III
CO4	Analyze and interpret data obtained using modern surveying techniques for Civil Engineering applications.	Analyze	IV

Module	**Module Contents**	**Hours**
I	**Fundamentals of Land Surveying and Linear Measurements** Introduction and applications of Geomatics, Historical development, classification,, principles, map-scale, Types of measurements and overview of surveying instruments, Linear distance measurement, offsetting, errors, corrections, prismatic compass, Bearings.	7
II	**Levelling, Contouring; and Precise Levelling** Concept of vertical control, Methods and equipment for levelling, adjustments of levelling equipment, interpretation of levels, Plotting of cross sections and profiles, sensitivity of level tube, Reciprocal levelling, Curvature and refraction corrections, Contouring methods, types, characteristics and use of contour maps, Precise levelling need, instrumentation and methods	6
III	**Theodolite Surveying** Introduction to Vernier Theodolite construction, functions, and applications; measurement of horizontal and vertical angles; temporary and permanent adjustments; basic field applications including ranging, line setting, and locating intersections etc., Theodolite traverse – fieldwork, computations, use of transit rule, Bowditch rule, and plotting, Checks in open and closed traverse, errors and precautions, Stadia tacheometry and trigonometrical levelling.	7

IV	**Curves** Curves –Types of Curves, Setting out of Horizontal curve, Components of Compound curve, Reverse curve. Transition Curve and Combined curve. Various types of vertical curves and its applications.	5
V	**Total Station Surveying** Introduction to Total Station and its importance in engineering surveying; components and working principles of Total Station; Electronic Distance Measurement (EDM) and Electronic Angle Measurement (EAM); advantages and limitations of Total Station compared with conventional surveying methods.	7
VI	**Modern Surveying Technologies** Introduction to modern surveying techniques; fundamentals of Global Positioning System (GPS) and Differential GPS (DGPS); components, working principle, sources of errors, and basic correction methods; overview of static and RTK surveying and applications in coordinate determination and control surveying. Introduction to drone (UAV) surveying; drone components and aerial data acquisition; basic principles of photogrammetry.	7

Text Books	
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,.

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

CO-PO Mapping

	Programme Outcomes (PO)											**PSPO**	
COs	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	2	2		1	2			3	1			2	2
CO2	1				3						2	1	
CO3	3	3	2	2	2	1					1	3	3
CO4	2	3		3	3	1			1		2	2	3

The strength of mapping: - 1: Low, 2: Medium, 3: High

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 25-30% weightage on modules 1 to 3 and 70-75% 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)

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information	
Programme	First Year B. Tech. Civil
Class, Semester	First Year B. Tech., Sem. I/II
Course Code	8BS104
Course Name	**Chemistry for Civil Engineering**
Desired Requisites:	Students are expected to know the basic concept in Chemistry.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ESE**	**Lab**	**Total**
Practical	2 Hrs/week	20	50	30	100
		Credits: 3			

Desired Knowledge
Basic knowledge of chemistry concepts studied at higher secondary level (10+2), Fundamental understanding of chemistry and mathematics concepts, elementary laboratory skills and scientific understanding.

Course Objectives	
1	To provide basic knowledge of chemistry and engineering materials used in civil engineering.
2	To develop an understanding of water quality, water chemistry, and water treatment methods.
3	To explain corrosion processes and methods for protecting construction materials and structures.
4	To introduce advanced materials, polymers, composites, and nanomaterial's used in modern infrastructure development.

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	Explain the chemistry of construction materials (Cement, Admixtures, Glass, Ceramics, and Metals), Polymers, and Composites.	II	Understand
CO2	Perceive electro-chemical mechanisms of corrosion, monitoring and prevention for various types of corrosion.	II	Understand
CO3	Summarize the chemical parameters pertaining to water and soil.	II	Understand
CO4	Discuss the chemistry of processes used in water treatment, and environmental changes in the atmosphere.	II	Understand
CO5	Explain the use of instrumental techniques, Sensors, and Probes in qualitative analysis.	II	Understand
CO6	Apply the analysis techniques to determine chemical water quality parameters.	III	Apply
CO7	Study the results of analysis and comment on the associated significance/effect.	III	Apply

Module	Module Contents	Hours
I	**Chemistry of Construction Materials** ***Portland Cement:*** Chemical composition, Manufacturing process, and Exothermic hydration reactions during setting and hardening ***Concrete Admixtures***: Chemical accelerators, retarders, plasticizers, and superplasticizers, Mineral admixtures (Blast furnace slag, Fly ash, and Silica fume) ***Glass & Ceramics***: Composition and properties of glass, sintering and vitrification for burnt clay brick and tiles. ***Metals and Alloys:*** Physical metallurgy of structural iron, steel variants (like TMT bars), aluminum alloys, and their respective crystal lattice structures.	8
II	**Polymer Chemistry and Advanced Composites** ***Structural Polymers***: Synthesis, properties, Types, and Applications ***Adhesives & Sealants:*** Structural epoxies, resins, and joint sealants ***Fiber-Reinforced Polymers:*** Properties, Types, Applications ***Geopolymer***: Chemical Structure, Geopolymerization, Applications ***Advanced Composites***: Types, Applications.	4
III	**Water and Soil Chemistry:** ***Water Quality Parameters***: pH, Acidity, Alkalinity, Hardness, Total Dissolved Solids, Chloride, Nitrate, Nitrite, TKN, Dissolved Oxygen, and Fluoride Soil Chemistry: Soil Mineralogical Composition, Chemical stabilization of expansive soils, Introduction to soil quality analysis.	3
IV	**Electrochemistry and Corrosion Science** Redox processes/potential, Fundamentals of corrosion, Electrochemical corrosion mechanisms, Factors affecting corrosion, Types of corrosion (uniform, pitting, crevice, galvanic), Corrosion monitoring & control, Corrosion prevention methods (coatings/anti-corrosive paints, cathodic protection).	5
V	**Environmental Systems in Civil Engineering** Use of chemicals in water treatment, Chemistry of alum coagulation, chlorination, and Ozonation, Exchange chemistry of Zeolite and resins, Electrocoagulation, Chemistry of photochemical smog, Acid rain, and Ozone layer depletion, Chemistry of acoustic insulation materials.	3
VI	**Analytical and Instrumental Techniques** ***Analytical***: Quantitative and Qualitative Analysis ***Instrumental:*** Spectrophotometry/Colorimetry, Chromatography, Mass Spectrometry, Introduction to XRD, XRF, and SEM. Use of Sensors & Probes in analysis.	3

List of Experiments/ Lab Activities (any 10)	
Sr. No.	**Water Quality Analysis:**
1	Determination of pH and TDS.
2	Determination of acidity (CO_2 and Total).
3	Determination of alkalinity (Bicarbonate, Carbonate, Hydroxide, and Total).
4	Determination of Carbonate, Non-carbonate, and Total hardness.
5	Estimation of chloride content in water (Argentometry).
6	Estimation of Dissolved Oxygen in water.

7	Estimation of Residual chlorine in water.
	Other Analysis :
8	Colorimetric analysis of Copper.
9	Purity of iron (Redox titration).
10	Corrosion rate of metals.
11	Preparation of resin.
12	pH of soil.
13	Demonstration of electrode probes/sensors for water/soil quality analysis.

Textbooks	
1	A. I. Vogel, *A Textbook of Quantitative Chemical Analysis*, 5th ed. London, U.K.: Longman Scientific & Technical, 1989.
2	B. K. Sharma, *Engineering Chemistry*. Meerut, India: Krishna Prakashan Media Pvt. Ltd., 2014.
3	C. Baird and M. Cann, *Environmental Chemistry*, 5th ed. New York, NY, USA: W. H. Freeman and Company, 2012.
4	J. R. Mihelcic and J. B. Zimmerman, *Environmental Engineering: Fundamentals, Sustainability, and Design*, 2nd ed. Hoboken, NJ, USA: John Wiley & Sons, 2014.
5	S. Rani, *Laboratory Manual on Engineering Chemistry*. New Delhi, India: Dhanpat Rai Publishing Co., 2018.

References	
1	J. Mendham, R. C. Denney, J. D. Barnes, and M. Thomas, *Vogel's Textbook of Quantitative Chemical Analysis*, 6th ed. Harlow, U.K.: Pearson Education, 2000.
2	C. N. Sawyer, P. L. McCarty, and G. F. Parkin, *Chemistry for Environmental Engineering and Science*, 5th ed. New York, NY, USA: McGraw-Hill, 2003.
3	P. N. Palanisamy and P. Manikandan, *Chemistry for Civil Engineers*. Chennai, India: Scitech Publications, 2010.
4	R. Barker, *An Introduction to Chemistry for Civil Engineers*. London, U.K.: Routledge, 2018.
5	S. Sahay, *Quantitative Chemical Analysis*. New Delhi, India: Tata McGraw-Hill Education, 2012.

Useful Links	
1	https://nptel.ac.in/courses/103107212
2	https://nptel.ac.in/courses/105106205
3	https://nptel.ac.in/courses/113108051
4	https://nptel.ac.in/courses/104105084
5	www.vlab.co.in

CO-PO Mapping (Theory)

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	-	1	2
CO1	3	2	-	-	-	-	-	-	-	-		-		
CO2	2	2	2	-	-	-	-	-	-	-		-		
CO3	3	3	2	-	-	-	-	-	-	-		-		
CO4	3	3	-	3	3	-	-	2	3	-		-		

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

A student shall be declared to have passed if the student secures a minimum of 40% marks in aggregate (LA + MSE + ESE) and a minimum of 40% marks in the End-Semester Examination (ESE) separately.

LA (Laboratory Assessment)	Continuous Learning Assessment based on laboratory performance, laboratory reports and viva voce	30 Marks
MSE (Mid-Semester Examination)	Written / Online Test covering approximately 50% of the theory course content	20 Marks
ESE (End-Semester Examination)	Written Examination covering 100% of the theory course content, with 70% weightage assigned to the on post mid-semester portion	50 Marks

Syllabus Prepared By	
Syllabus Checked By	

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information	
Programme	First Year B. Tech. Civil Engineering
Class, Semester	First Year B. Tech., Sem. I/II
Course Code	8BS102
Course Name	Introduction to Mechanics
Desired Requisites:	Basic concepts of 10+2 level Physics.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	1 Hrs/week	**MSE**	**ESE**	**Lab**	**Total**
Practical	2 Hrs/week	20	50	30	100
		Credits: 2			

Course Objectives

1	To provide fundamental scientific concepts for solving engineering and technical problems.
2	To develop analytical and critical thinking skills required for engineering studies.
3	To enhance the understanding of modern engineering and technological developments.
4	To develop experimental skills and the ability to analyze and interpret engineering data.

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	Exhibit memory of previously learned information by recalling facts, terms, and basic concepts in Physics.	I	Remember
CO2	Demonstrate understanding of facts and ideas by recalling, comparing, interpreting the terms in Physics.	II	Understand
CO3	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules for various concepts in Physics.	III	Apply
CO4	Analyze engineering systems for solving problems.	IV	Analyze

Module	Module Contents	Hours
I	**Physical Quantities and Measurements:** SI Units and Dimensions, Scalars and Vectors, Vector Algebra, Engineering Measurements and Errors.	2
II	**1-D Kinematics:** Position, Velocity and Acceleration, Equations of Motion, Free Fall Motion.	3
III	**2-D Kinematics:** Vector Components, Relative Motion, Projectile Motion.	2
IV	**Friction:** Definition and Introduction, Types of Friction, Limiting Friction, Coefficient of Friction, Numericals on Friction.	2
V	**Rectilinear Motion:** Rectilinear motion, Motion under gravity, V-T Diagram and A-T Diagram, Numericals on Rectilinear motion.	2
VI	**Curvilinear Motion:** Curvilinear motion, Motion on flat curve, Motion on Banked roads.	2

List of Experiments/ Lab Activities (Any 8-10)	
1	Determine Young's modulus of a given wire.
2	Determine the force constant of a helical spring.
3	Determine the relationship between angle of inclination and downward force using an inclined plane.
4	Determine the range of projectile motion for different angles of projection.
5	Determine the acceleration due to gravity using a simple pendulum.
6	Determine the coefficient of friction between commonly used construction materials.
7	Determine the angle of repose of granular construction materials.
8	Determine the velocity of sound in air using a resonance tube.
9	Determine the thermal conductivity of a building material.
10	Determine the sound absorption coefficient of common building materials using the reverberation time method.
11	Determine the coefficient of thermal expansion of an engineering material.
12	Study laser-based alignment and levelling techniques used in surveying applications.
13	Determination of Angle of Friction using Inclined Plane.
14	Determination of Acceleration Due to Gravity (g) Using Compound Pendulum.
15	Verification of Equations of Motion using Dynamic Cart.

Textbooks	
1	M. N. Avadhanulu and P. G. Kshirsagar, “A Text book of Engineering Physics”, S.Chand Pub.
2	Bhattacharya & Nag, Engineering Physics
3	Harnam Singh, *Advanced Practical Physics for Students*, S. Chand & Company Ltd., Revised Edition, 2011, Volumes I & II.
References	
1	R. C. Hibbeler**,** *Engineering Mechanics: Statics and Dynamics*, 15th Edition, Pearson Education, 2022.
2	S. Timoshenko and D. H. Young**,** *Engineering Mechanics*, 5th Edition, McGraw-Hill Education, 2013.
3	Halliday, Resnick and Walker, *Fundamentals of Physics*, 12th Edition, Wiley India, 2022.
Useful Links	
1	https://onlinecourses.nptel.ac.in/e-learning
2	https://swayam.gov.in/nc_details/NPTEL
3	https://ocw.mit.edu/search/

CO-PO Mapping

	Programme Outcomes (PO)											**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	1									1		
CO2	3	2		1							1		
CO3	3	3	2	2							1		
CO4	3	3	2	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 (Theory)

The assessment is based on MSE and ESE.

MSE shall be typically on modules 1 to 3.

ESE shall be on all modules with around 30% weightage on modules 1 to 3 and 70% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Assessment (Lab)

There is one component of lab assessment that is Lab ESE.

IMP: Lab ESE is a separate head of passing (min 40 %).

Assessment	Based on	Conducted by	Typical Schedule	Marks
Lab ESE	Lab Activities/ Journal/ Performance/ Presentations/ Oral/ Mini Project	Lab Course Faculty and External Examiner as applicable	During Week 1 to Week 13. Marks Submission at the end of Week 13.	30

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.

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-2027

Course Information	
Programme	First Year B. Tech.
Class, Semester	Sem I and Sem II
Course Code	8AC151
Course Name	Professional Communication
Desired Requisites:	10+2 level English

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

Course Objectives

1	Enable clear, confident, and context-aware communication (verbal, non-verbal, written, digital)..
2	Prepare students to understand and apply effective listening, feedback and professional writing skills required for academic and career contexts.
3	Develop oral communication skills including public speaking, group discussion, debate and persuasion skills
4	Inculcate understanding of teamwork, collaboration, and digital communication, and equip students with personal branding and career communication skills.

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	Communicate clearly, confidently, and competently in diverse real-world scenarios	Apply
CO2	Demonstrate adequate proficiency in language.	Apply
CO3	Demonstrate communication skills (LSRW) in personal and professional settings.	Apply
CO4	Work effectively in teams and apply communication and interpersonal skills for career readiness.	Apply

Module	Module Contents	Hours
	Foundations of Communication	
1	Communication -Nature, Types, and Principles. Barriers to Effective Communication and overcoming them. Developing Effective Listening Skills: Types, listening and note-making.	**2**
	Language Skills & Communicative Grammar	
2	Vocabulary precision, clarity. Modal verbs, passives, phrasal verbs. Common errors & editing Communicative Grammar: modal verbs, question tags, misplaced modifiers, passives Reading comprehension	**2**
	Non-Verbal Communication & Vocalics	
3	Understanding Non-Verbal Communication — Scope and Significance, Codes of non-verbal communication. Vocalics —Understanding Pronunciation, Intonation, and Voice modulation, eliminating fillers Developing Non-verbal skills for professional settings	**3**
	Formal Oral Communication Skills	
4	Presentation Skills — Structure, Delivery and Confidence. Techniques for public speaking. Group Discussion: Types, Dynamics, and Techniques Introduction to Debate: Structured Arguments and Rebuttal Techniques	**2**
	Professional Writing & Business Communication	
5	Introduction to academic writing. Principles of Professional Writing: Brevity, Clarity and Pragmatic writing, Cover letter writing. Résumé Writing: Formats, ATS Compatibility	**2**
	Interpersonal, Teamwork & Career Communication Skills	
6	Interpersonal skills- Significance, Emotional Intelligence (EQ) —Cores of Emotional Intelligence Team Building: Definition, Hierarchy and Team Dynamics Personal Branding in the Digital Age — LinkedIn and Social Media Strategy Interview Skills: Types, STAR Method, Mock Interview Preparation	**3**

Textbooks	
1	Adler, R.B. & Rodman, G. — Understanding Human Communication, Oxford University Press
2	Sanjay Kumar & Pushpalata — Communication Skills, Oxford University Press, First Edition, 2012
3	Cialdini, R. — Influence: The Psychology of Persuasion, Harper Business
References	
1	Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hills publishing Company 2006
2	William Sanborn Pfeiffer, T.V.S. Padmaja, Technical Communication: A Practical Approach, Pearson, Sixth Edition 2012
3	Reynolds, G. — Presentation Zen: Simple Ideas on Presentation Design and Delivery, New Riders
4	Exercises in Spoken English, Parts I and II, CIEFL, Hyderabad, Oxford University Press
Useful Links	
1	www.ted.com/talks — TED Talks on Communication

Syllabus Prepared By	Dr. A. A. Mohite, Dr. B. N. Jamadar and Dr. K. V. Madhale
Syllabus Checked By	Head, Department of Civil Engineering

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Course Assessment Plan — Notional Learning Hours

Professional Communication | First Year B Tech | Sem I & II | Credits: 2 | Total NLH: 60

Sl. No.	Assessment Type	Brief Description	Marks	Notional Learning Hours (NLH)	A T*	CO Mapped	Bloom's Taxonomy Level
1	Tutorial Exercise	Structured exercises based on Module I & II topics	20	8	LA1	CO2	Apply (L3)
2	Listening + Note-Making Task	Audio-visual listening exercise with note-making and summary writing from Module I	10	8	LA1	CO1, CO2	Apply (L3)
3	Oral Presentation	Individual 10-minute structured presentation evaluated via rubric (Module IV)	10	10	LA2	CO1, CO3	Apply (L3)
4	Group Discussion / Debate	Mock GD / Debate on current affairs or case-based topics (Module IV)	10	10	LA2	CO3, CO4	Apply (L3)
5	Professional Writing Task	Email makeover + Résumé peer review using ATS simulation (Module V)	10	8	LA2	CO1, CO4	Apply (L3)
6	End-Semester Examination	Oral exam covering all 6 modules (30–40% weightage on Modules 1–3; 60–70% on Modules 4–6)	40	16	ESE	CO1–CO4	Apply (L3)
Total			**100**	**60**	—		

Notes: | **AT**= Assessment Type. NLH **= Notional Learning Hours** includes lecture contact hours, tutorial hours, self-study, and assessment preparation. | Total NLH = 60 (as per 2-credit course norm: 1 credit = 30 NLH).

Notional Learning Hours breakup as per component.

Component	Hours	Basis
Lecture contact hours (1 hr/week × 14 teaching weeks)	14	Teaching scheme
Tutorial / Lab contact hours (1 hr/week × 14 teaching weeks)	14	Teaching scheme
Self-study, reading & comprehension practice	12	Home preparation
Assessment preparation (LA1 + LA2 + ESE)	12	Assessment plan
Co-curricular / Activity-based learning tasks	8	Activity sessions
Total Notional Learning Hours	**60**	1 Credit = 30 NLH × 2 Credits

CO-PO Mapping

	Programme Outcomes (PO)											**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1									3		2			
CO2									3		2			
CO3							2		2		2			
CO4								3	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.

Syllabus Prepared By	Mr. M H Kalawate
Syllabus Checked By	

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27 onwards

Course Information					
Program	B. Tech. (Civil Engineering)				
Class, Semester	First Year B.Tech., Semester- II				
Course Code					
Course Name	Land Surveying Laboratory				
Desired Requisites:	-				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	-				
Interaction	-	**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)

After completion of the course, the students will be able to

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	Explain the principles and applications of conventional surveying techniques and instruments.	Understand	II
CO2	Demonstrate the use of modern surveying equipment for land and topographic surveying.	Understand	II
CO3	Apply surveying methods to collect, process, and present field data for engineering applications.	Apply	III
CO4	Analyze and interpret survey data obtained using conventional and modern surveying techniques for Civil Engineering applications.	Analyze	IV

List of Experiments/ Lab Activities/ Topics

List of Experiments:

1. Study and temporary adjustments of levelling instruments.
2. Differential levelling and reduction of levels using Height of Instrument (HI) method.
3. Differential levelling and reduction of levels using Rise and Fall method.
4. Reciprocal levelling and application of curvature and refraction corrections.
5. Contouring of a selected area and preparation of contour maps.
6. Measurement of horizontal and vertical angles using Vernier Theodolite.
7. Determination of heights and distances using Stadia Tacheometry / Trigonometrical Levelling.
8. Theodolite traversing and field data collection.
9. Study and field operation of Total Station for coordinate measurement and topographic survey.
10. Demonstration and field exercise on DGPS (Static and RTK mode) for coordinate determination.
11. Drone survey planning, aerial image acquisition, and generation of Orthomosaic / Elevation Model for preparation of topographic map.

Text Books	
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	Arora K. R. “Surveying”, Vol. 1 & 2, Standard Book House, Kota 16th edition, 2018,.
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

CO-PO Mapping

	Programme Outcomes (PO)											**PSPO**	
COs	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	2			1				1			3	2
CO2	2	1		1	3			2	1		2	2	1
CO3	3	2	2	2	3	1		2	2		1	3	2
CO4	2	3		3	3	1		1	2		2	2	3

The strength of mapping: - 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 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, attendance, journal	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.

Prepared by	DAC/BoS Secretary	Head/BoS Chairman