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||Jai Sri Gurudev||

Sri Adichunchanagiri Shikshana Trust (R.)

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

AICTE Approved, Accredited by NAAC with A+ Grade & NBA (CSE, ISE, ECE, ME & CV), NIRF(151-300) in 2023,Gold Rated by QS I-Gauge

P.B. No.20, B.B Road, Chikkaballapur - 562 101, Karnataka

Estd : 1986

III Semester
Scheme & Syllabus of B.E. Programme
Civil Engineering
(2025 Scheme)

Core Values

Spiritual, **J**udicious, **C**ommitment, **I**ntegrity, **T**rustworthy



NATIONAL INSTITUTIONAL RANKING FRAMEWORK 151-300

NAAC A+

QS I-GAUGE GOLD

INSTITUTION'S INNOVATION COUNCIL (Ministry of HRD Initiative) 4-Star Rating

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Sri Adichunchanagiri Shikshana Trust (R.)
SJC INSTITUTE OF TECHNOLOGY
(An Autonomus Institute Under VTU Belagavi & Approved by AICTE, New Delhi)
Accredited by NAAC with A+ Grade & NBA (CSE, ISE, ECE, ME & CV), NIRF (151-300), QS-I Gauge GOLD Rated
Post Box #20, B.B. Road, Chikkaballapur - 562 101, Karnataka
Estd.:1986

B.E. in Civil Engineering

Scheme of Teaching and Examinations 2025

Outcome-Based Education(OBE) and Choice-Based Credit System (CBCS) (Effective from the academic year 2025-26)

III SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Department (TD)and Question Paper Setting Board(PSB)	Teaching and Learning Scheme					Examination				Credits
					CI		LI	TW & SL	Total Hours per Sem	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	SL						
1	ASC	1BMATC301	Computational and Statistical Methods	Mathematics	42	28	0	50	120	3	50	50	100	4
2	IPCC	1BCV302	Public Health Engineering	CIVIL	42	0	28	50	120	3	50	50	100	4
3	IPCC	1BCV303	Strength of Materials	CIVIL	42	0	28	50	120	3	50	50	100	4
4	PCC	1BCV304	Building Materials	CIVIL	42	0	0	48	90	3	50	50	100	3
5	PCC	1BCV305	Surveying	CIVIL	42	0	0	48	90	3	50	50	100	3
6	PCCL	1BCVL306	Computer Aided Building Planning and Drawing Lab	CIVIL	0	0	28	02	30	3	50	50	100	1
7	AEC	1BCVL307x	Ability Enhancement Course Laboratory**	CIVIL	0	0	28	02	30	2	50	50	100	1

8	SDC	1BCP308	Community Project	Any Department/ Respective Engineering Dept.		0	0	0	30	30	2	50	50	100	1
9	NCMC	1BNS309	National Service Scheme	Campus	NSS Coordinator	0	0	0	28	28	--	100	---	100	PP
		1BPE309	Physical Education		Physical Education Director										
		1BYO309	Yoga		Yoga Teacher										
		1BMU309	Music		Music Teacher										
		1BNC309	National Cadet Corps - I		NCC Coordinator										
10	NCMC	1BCE310	Competency Enhancement Course-1	CDCAC		14	0	0	14	28	--	100	---	100	PP
11	NCMC	1BMATDIP311	Additional Mathematics – I	Maths Dept.		14	0	0	14	28	--	100	---	100	PP
					Total							**700**	**400**	**1100**	**21**

Ability Enhancement Course (Laboratory) 1BCVL307x			
1BCVL307A	Digital Tools for Engineering Analysis	**1BCVL307C**	Python Programming Applications Lab
1BCVL307B	Structural Behaviour Visualization Lab	**1BCVL307D**	Engineering Geology Lab

Semester: III					
Computational and Statistical Methods **Stream: CV**					
Course Code	**:**	1BMATC301	**Credits**	**:**	4
Hours/Semester (L:T:P:SL)	**:**	42:28:0:50	**CIE**	**:**	50 Marks
Total Hours	**:**	120	**SEE**	**:**	50 Marks
Course Type	**:**	ASC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Differential calculus and Numerical Methods
Knowledge on Fundamental Concepts	Curves, Probability, Optimization
Knowledge on Connected Tools (If any)	Basic computer knowledge

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the concept and importance of curve fitting for data analysis and prediction.
CLO2	Introduce the concept of random variables, probability distributions, specific discrete and continuous distributions.
CLO3	Solve the extremals of functionals using calculus of variations.
CLO4	Gain Knowledge of numerical techniques for solving partial differential equations in civil structures.
CLO5	Introduce the fundamentals of optimization and linear programming as effective tools for decision-making in engineering problems.

Module – 1	**08 Hrs**
Curve fitting and Statistical Analysis: Curve fitting by method of least squares: $y = ax + b$,$y = ax^2 + bx + c$,$y = ab^x$, Correlation – Karl Pearson's coefficient of Correlation, Regression analysis – lines of regression (without proof), Rank Correlation, – problems. **Text Book 1:** Ch 24: 24.5(a), 24.5(b),24.6(1). Ch 25: 25.12,25.13,25.16,25.14.	
Module – 2	**8 Hrs**
Probability Distributions: Random Variables (Discrete and Continuous), Probability mass and density functions, Mathematical expectation and variance. Discrete probability distributions - Binomial, Poisson, Normal distributions (derivations for mean and standard deviation for Binomial and Poisson distributions only) - Illustrative examples. **Text Book 1:** Ch 26:26.7,26.8,26.9,26.10,26.14,26.15,26.16,26.19(6).	
Module – 3	**8 Hrs**
Calculus of Variations: Variation of a function and a functional. Extremal of a functional, Variational Problems, Euler's equation(Derivation) and problems, Standard Variational Problems including Geodesics(Hanging Chain Problem, Brachistochrone Problem, shortest path between two points), Minimal surface of revolution. **Text Book 1:**Ch 35: 35.2,35.3,35.4,35.5.**Text Book 2:**Chapter 12: 12.1, 12.2	
Module – 4	**8 Hrs**
Applications of Partial Differential Equations: Classifications of second-order partial differential equations, finite difference approximations to derivatives, Solution of Laplace's equation using standard five-point formula. Beam bending equation (Derivation) and solution, simply supported beam with central concentrated load and problems. **Text Book 1:**Ch 18: 18.1 to 18.4, 18.9.	

Module – 5	8 Hrs
Optimization Techniques: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method, Simplex method, Relaxation method and Big M method. **Text Book 1:**Ch 34**:** 34.1,34.2,34.3,34.7.	

Modules	Self Study/ Applications
Module-1	**Applications:** Multiple regression in performance tuning and optimization in software engineering. **Self-Study:** Angle between lines of Regression.
Module-2	**Applications:** Analyze the performance of the algorithms. **Self Study:** Exponential distribution.
Module-3	**Application:** Geodesics (shortest path problem on curved surfaces) **Self-study :** Isoperimetric problems
Module-4	**Applications:** Vibration analysis (wave equation) – in structures. Self-Study: Solution of the Wave equation Problems. **Self Study:** Finite Difference Method for ODEs
Module-5	**Application:** Structural cost optimization using Linear Programming **Self-study :** Assignment problems.

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the principles of least squares to perform curve fitting and Analyze data using correlation and regression techniques.
CO2	Solve problems involving uncertainties in engineering systems by utilizing probability distributions and random variable concepts.
CO3	Analyze the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.
CO4	Solve partial differential equations numerically using finite difference methods to analyze physical phenomena in civil structures.
CO5	Analyze the fundamentals of optimization and linear programming as effective tools for decision - making in engineering problems.

Reference Books	
1	Higher Engineering Mathematics, B. S. Grewal, 44th Edition, Khanna Publishers,2021, ISBN: 978 – 81 – 933284 – 9 - 1.
2	A Textbook of Strength of Materials (Mechanics of Solids) (SI Units), R. K. Bansal, 7th Edition, 2024–25, Laxmi Publications (P) Ltd., ISBN: 978-81-318-0814-6
3	Higher Engineering Mathematics, B. V. Ramana: McGraw-Hill Education, 11th Ed., 2017, ISBN: 30 – 13 – 978 - 00706341901.
4	A Textbook of Engineering Mathematics, N. P. Bali and Manish Goyal: Laxmi Publications, 10th Ed., 2022.ISBN-13: 978-9352743766

Reference Books	
1	Calculus,James Stewart,Cengage Publications, 7th Ed., 2019. ISBN-13:978-0538497909
2	Engineering Mathematics,Srimanta Pal &Subodh C. Bhunia: Oxford University Press, 3rd Ed., 2016. ISBN-13. 978-0199099153
3	Advanced Engineering Mathematics, C. Ray Wylie, Louis C. Barrett, McGraw – Hill Book Co., New York, 6th Ed., 2017. ISBN-13 978-0071135436
4	Higher Engineering Mathematics, H. K. Dass, Rama Verma and RajnishVerma, S. Chand Publication, 3rd Ed.,2014. ISBN-13. 978-8121938907

Web links and Video Lectures (e – Resources)	
1	**Online Mathematics Courses and Certifications**: http://www.class-central.com/subject/math(MOOCs)
2	**Role of Probability in Civil Engineering :** https://nptel.ac.in/courses/105105045?utm_source=chatgpt.com

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	3	2	1				1	1		1		1
CO2	3	3	2	1				1	1		1		1
CO3	3	3	2	2				1	1		1	1	1
CO4	3	3	2	2				1	1		1	1	1
CO5	3	3	2	1	1			1	1		1	1	1

Semester: III						
Public Health Engineering **Stream: CV**						
Course Code	**:**	1BCV302		**Credits**	**:**	4
Hours/Semester (L:T:P:SL)	**:**	42:0:28:50		**CIE**	**:**	50 Marks
Total Hours	**:**	120		**SEE**	**:**	50 Marks
Course Type	**:**	IPCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Environmental Studies, Basic Science
Knowledge on Fundamental Concepts	Sources of Water, Hydrologic Cycle, Chemistry
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Determine the variation of community water needs using the concepts of water demand and water requirement.
CLO2	Assess the safety and quality of public water supply using drinking water quality standards.
CLO3	Apply the various water treatment options and distribution.
CLO4	Analyze the unit operations and unit processes involved in water and wastewater treatment.
CLO5	Design attached growth processes for sewage treatment and reuse.

Module – 1	**08 Hrs**
Introduction: Need for protected water supply, Demand of Water: Types Of Water Demands, Factors affecting per capita demand, Variations in demand of water, Peak factor. Design Period, Factors Governing Design Period. Methods Of Population Forecasting and numerical problems. Physico-Chemical Characteristics Of Water. Drinking Water Standards - BIS 10500:2012 Specification. **Text Book 1:**Ch 5:5.1-5.8, Ch 6:6.1-6.6. **Text Book 3:** Ch 2:2.2-2.5 &Ch 3:3.1-3.4	
Module – 2	**08 Hrs**
Water Treatment: Objectives, Unit Flow Diagrams – Significance of each unit, **Sedimentation**: Theory, Types and Design with numerical, Coagulation and Flocculation, Types of Coagulants. **Filtration:** Mechanism of filtration, Types of filters: Slow Sand, Rapid Sand And Pressure Filters. Operation and Cleaning. Design of Slow and Rapid Sand Filter Without Under Drainage System, Numerical. **Text Book 1:** Ch 7.1-7.7	
Module – 3	**08 Hrs**
Disinfection: Methods of Disinfection. Breakpoint Chlorination, **Softening:** Lime Soda and Zeolite Process. Defluoridation. Reverse Osmosis, Membrane Filter, **Distribution System:** Layout, hydraulics of pipe lines, pipe fittings/specials, valves including check and pressure reducing valves, meters, leak detection, maintenance of distribution systems. **Text Book 1:** Ch 9:9.1-9.5 Ch 10:10.1-10.6, Ch 14:14.1-14.6, Ch 15:15.1-15.6	
Module – 4	**08 Hrs**
Wastewater: Need for Sanitation, Methods of Sewage Disposal, Types of Sewerage Systems, Waste Water Characteristics - Physical, Chemical and Biological Characteristics, BOD/COD Ratio Numerical on BOD. **Treatment Process:** Flow Diagram For Municipal Waste Water Treatment, Screens - Types, Disposal. Grit Chamber, Oil and Grease Removal. Primary and Secondary Settling Tanks.	

Biological Treatment Process: Suspended Growth System - Conventional Activated Sludge Process, Modifications of ASP, Numerical. **Text Book 2:**Ch 7:7.2-7.5, Ch 9:9.1-9.6
Module – 5 **08 Hrs**
Biological &Advanced Treatment: Attached Growth Process-Trickling Filter, Theory, Types, Numericals, Bio-Towers and Rotating Biological Contactors. Stabilization Ponds, Oxidation Ditch. Sludge Digesters (aerobic and anaerobic), Thickeners and Drying Beds. Sequencing Batch Reactor (SBR) - UASB, Microfiltration (MF), Ultrafiltration (UF), Nanofiltration (NF), Reverse Osmosis (RO), Application of AI in the Water and Wastewater Treatment. **Text Book1:**Ch 14.14.1-14.7

Practical Component of IPCC	
	List of Experiments
1.	Determination of Alkalinity, Acidity and pH.
2.	Determination of Calcium, Magnesium and Totals Hardness.
3.	Determination of Dissolved Oxygen.
4.	Determination of BOD.
5.	Determination of Available Chlorine in a sample of Bleaching Powder.
6.	Determination of Residual Chlorine.
7.	Determination of Total Suspended Solids, Dissolved Solids, Volatile Solids, Fixed Solids, Settleable Solids.
8.	Determination of Fluoride concentration and Turbidity.
9.	Determination of Sulphate concentration.
10.	Demonstration of Determination of COD.

Topics for Self-learning	
Module – 1	Analyze the impacts of climate change on water resources
	Examine major water supply schemes in India, such as the Jal Jeevan Mission.
Module – 2	Evaluate membrane water treatment technologies and their applications.
	Investigate natural treatment systems and constructed wetlands for wastewater treatment.
Module – 3	Explore the design, operation, and benefits of smart water distribution networks.
	Assess the role of wastewater epidemiology in public health monitoring and disease surveillance.
Module – 4	Assess Wastewater epidemiology and public health.
	Study energy recovery techniques from wastewater and their sustainability benefits.
Module – 5	Understand the principles, components, and applications of Zero Liquid Discharge (ZLD) systems.
	Interpret objectives of United Nations Sustainable Development Goal 6 (SDG 6) and evaluate its relationship with wastewater management

Course Outcomes: After completing the course, the students will be able to	
CO1	Design a community water supply system considering average and peak water demand.
CO2	Analyze the water quality and environmental significance of various parameters.
CO3	Apply knowledge of wastewater characteristics to select appropriate treatment methods.
CO4	Analyze the various units of wastewater treatment plant.
CO5	Evaluate the performance and suitability of recent sewage treatment technologies for different conditions.

Text Books	
1	Water Supply Engineering, B.C.Punmia and Ashok Jain, Laxmi Publications (P) Ltd., New Delhi, 2010, ISBN: 8131807037.
2	Water Supply Engineering, S.K.Garg, Khanna Publishers, New Delhi, 28thedition, 2017, ISBN: 8174092304.
3	Environmental Engineering, S. K. Garg, Volume-I, M/s Khanna Publishers, New Delhi, 2010, ISBN: 8174091203.

Reference Books	
1	Environmental Engineering, Howard S. Peavy, Donald R. Rowe, George T, Tata McGraw Hill, New York, Indian Edition, 2013, ISBN: 9351340260.
2	Wastewater Treatment Concepts and Design Approach, Karia G.L., and Christian R.A, Prentice Hall of India Pvt. Ltd., New Delhi. 3rd Edition, 2017, ISBN: 8119364163.
3	Environmental Engineering Volume-II, B C Punmia, Laxmi Publications, 2nd Edition, 2016, ISBN: 8131805964.
4	CPHEEO Manual on Water Supply and Treatment Engineering, Ministry of Urban Development, Government of India, New Delhi.

Web links and Video Lectures (e – Resources)	
1	**Water Disinfection Methods: https://www.youtube.com/watch?v=YUaqJYq-i00**
2	**Introduction to Biological Process Design for Wastewater Treatment: https://www.youtube.com/watch?v=TZlA-6tHqTo**
3	**Water Softener System : How It Works: https://www.youtube.com/watch?v=G66IR8kS0uQ**

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	3			2	2				1	2	
CO2	3	2		1		2	2				1	2	
CO3	3	2	2			2	2				1	3	2
CO4	2	3	2	1		2	2	2			1	3	2
CO5	2	3	3	1		2	2				1	2	

Semester: III						
Strength of Materials **Stream: CV**						
Course Code	**:**	1BCV303		**Credits**	**:**	4
Hours/Semester (L:T:P:SL)	**:**	42:0:28:50		**CIE**	**:**	50 Marks
Total Hours	**:**	120		**SEE**	**:**	50 Marks
Course Type	**:**	IPCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Engineering Mechanics
Knowledge on Fundamental Concepts	Properties and Behavior of materials, Statics, Calculus, Algebra, Differential Equations, Force-Motion Relationships, Work-Energy Principles
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Apply stress–strain relationships and material property concepts to evaluate the stress and strain responses of structural members subjected to various loading conditions.
CLO2	Construct shear force and bending moment diagrams for various beam configurations.
CLO3	Apply bending and shear stress theories to analyze beams with different cross-sections.
CLO4	Determine slope and deflection of beams using standard methods and assess the stability of columns.
CLO5	Analyze circular shafts under torsion and pressure vessels under internal and external pressure.

Module – 1	**08 Hrs**
Simple Stresses and Strains: Introduction, Properties of Materials, Stress, Strain, Hook's Law, Poisson's Ratio, Stress–Strain Diagram for Structural Steel, Total Elongation of Tapering Bars of Circular and Rectangular Cross Sections. Composite Section, Volumetric Strain, Expression for Volumetric Strain, Elastic Constants, Relationship among Elastic Constants, Thermal Stress and Strains. **Compound Stresses:** Introduction, General Two-Dimensional Stress System, Principal Stresses and Principal Planes. **AI for Material Science:** AI to Predict Stress and Strains Based on Photos. **Text Book 1:** Ch 1-4. **Text Book 2:** Ch 1- 3.	
Module – 2	**08 Hrs**
Bending Moment and Shear Force Diagrams in Beams: Definition of Shear Force and Bending Moment, Sign Convention, Relationship Between Loading, Shear Force and Bending Moment, Development of Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) With Salient Values for Cantilever, Simply Supported and Overhanging Beams subjected to Point Loads, UDL (Uniformly Distributed Load), UVL (Uniformly Varying Load) and Couple. **Text Book 1:** Ch 8. **Text Book 2:** Ch 6.	
Module – 3	**08 Hrs**
Bending Stress in Beams: Introduction, Bending Stress in Beam, Pure Bending, Assumptions in Simple Bending Theory, Derivation of Simple Bending Equation (Bernoulli's Equation), Modulus of Rupture, Section Modulus, Flexural Rigidity. **Shear Stress in Beams:** Derivation of Shear Stress Intensity Equations, Problems on Calculation of the Shear Stress Intensities at Various Critical Levels of T, I Sections.	

Text Book 1: Ch9 –10.
Text Book 2: Ch 7- 8.

Module – 4	**08 Hrs**

Deflection of Beams: Definition of Slope, Deflection and Curvature, Sign Conventions, Moment- Curvature Equation. Double Integration Method and Macaulay's Method: Slope and Deflection of Determinate Prismatic Beams subjected to Standard Loading Cases.
Columns and Struts: Introduction, Short and Long Columns. Effective Length, Slenderness Ratio, Euler's Theory; Assumptions, Derivation for Euler's Buckling Load for Different End Conditions (Fix-Free, Fix-Fix, Pin-Pin), Limitations of Euler's Theory. Rankine-Gordon's Formula for Columns.
Text Book 1: Ch11, Ch 19.
Text Book 2: Ch 12-13, Ch 19.

Module – 5	**08 Hrs**

Torsion in Circular Shaft: Introduction, Pure Torsion, Assumptions, Derivation of Torsion Equation for Circular Shafts, Torsional Rigidity and Polar Modulus, Power Transmitted by a Shaft.
Thin and Thick Cylinders: Introduction, Thin Cylinders Subjected to Internal Pressure, Hoop Stresses, Longitudinal Stress and Change in Volume. Thick Cylinders Subjected to Both Internal and External Pressure.
Text Book 1: Ch 20, Ch 22-23.
Text Book 2: Ch 16-18.

Practical Component of IPCC	
	List of Experiments
1.	Density of Ferrous and Nonferrous metals
2.	Tension Test on Mild Steel and HYSD Bars.
3.	Compression Test on HYSD and Cast Iron.
4.	Bending Test on Wood under Two-Point Loading.
5.	Bending Test on Mild Steel or HYSD Bars
6.	Shear Test on Mild Steel –Single and Double Shear.
7.	Impact Test on Mild Steel (Charpy and Izod).
8.	Torsion Test on Mild Steel Specimens.
9.	Hardness Test on Different Types of Materials (Brinell and Rockwell).

Topics for Self learning	
Module – 1	Explore the applications of smart materials in engineering structures.
	Explore an AI tool that predicts material properties or deformation from images.
Module – 2	Study the basic features of structural analysis software such as STAAD.
	Analyze the use of beams in bridges and building structures.
Module – 3	Explore the applications of composite and sandwich beam structures.
	Review failure cases of structural members and identify the causes of failure.
Module – 4	Investigate buckling failures in real engineering structures.
	Study the basic features of deflection of beams using a software such as STAAD Pro.
Module – 5	Explore the applications of composite shafts in automotive and aerospace systems.
	Explore industrial applications of pressure vessels.

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze the fundamental behavior of structural materials by evaluating stresses, strains, and elastic constants under axial, thermal, and compound loading conditions.
CO2	Construct shear force and bending moment diagrams for various beam types by establishing relationships between different loading configurations and internal forces.
CO3	Determine the distribution of bending and shear stresses across diverse cross-sections using the governing equations of simple bending and shear intensity.
CO4	Evaluate beam deflections using integration methods and predict the buckling loads of columns based on Euler's and Rankine's theories.
CO5	Apply torsion theory to calculate power transmission in shafts and apply pressure vessel concepts to evaluate stresses in thin and thick-walled cylinders.

Text Books	
1	Strength of Materials, B.C Punmia, Ashok Jain, Arun Jain, Laxmi Publications 10th Edition, 2018.ISBN:978-8131809259
2	A Textbook of Strength of Materials, R.K. Bansal, Laxmi Publications, 5th Edition, 2012, ISBN-13: 978-8131808146.
3	Strength of Materials, S S Rattan, 3rdedition, McGraw Hill Education, 2017,ISBN-13 978-9385965517

Reference Books	
1	A Textbook of Strength of Materials, R.K. Bansal, Laxmi Publications, 5th Edition, 2012, ISBN-13: 978-8131808146.
2	Theory of Structures, S. Ramamrutham, 9th Edition, DhanpatRai Publishing Company Private Limited, New Delhi. 2014. ISBN-13: 978-9384378103.
3	Elements of Strength of Materials, Timoshenko and Young, East-WestPress,5th Edition, 2011,ISBN: 9788176710190.
4	Strength of Materials- Part 1 Elementary Theory And Problems: Elementary Theory and Problems, Stephen Timoshenko, 3rd Edition,Vol. I,CBS Publishers and Distributors Pvt. Ltd,2021,ISBN-13:978-8123910307

Web links and Video Lectures (e – Resources)	
1	**StrengthofMaterialswebcoursebyIITMadras:**https://www.youtube.com/watch?v=La4UEa7hA7Q&list=PLJoALJA_KMOARYNi50T6b488kPUBbOIsX
2	**StrengthofMaterialsvideocoursebyIITKharagpur:**https://nptel.ac.in/courses/105105108/
3	**Artificial Intelligence for Materials Science:** https://www.mpie.de/4867299/artificial_intelligence

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	1		2		1	3	2		1	3	2
CO2	3	3	2								1	3	2
CO3	3	3	2	1	2		1	3	2		1	3	2
CO4	3	3	3	1							1	3	2
CO5	3	2	2	1	2	1	1	3	2		1	3	2

Semester: III						
Building Materials **Stream: CV**						
Course Code	**:**	1BCV304		**Credits**	**:**	3
Hours/Semester (L:T:P:SL)	**:**	42:0:0:48		**CIE**	**:**	50 Marks
Total Hours	**:**	90		**SEE**	**:**	50 Marks
Course Type	**:**	PCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Elements of Civil Engineering
Knowledge on Fundamental Concepts	Construction Materials, Structures and Building Components
Knowledge on Connected Tools (If any)	**----**

Course Learning Objectives: This course will enable the students to	
CLO1	Classify the properties and applications of building materials, stones, aggregates and masonry units.
CLO2	Illustrate the characteristics and applications of cement, mortar, and concrete in construction.
CLO3	Compare the properties and uses of timber, steel, glass, gypsum, plastics and paints.
CLO4	Assess modern building materials and smart materials for construction applications.
CLO5	Choose suitable building components and construction practices for building works.

Module – 1	**08 Hrs**
Building Materials: Introduction, importance, classification and properties of building materials. **Building Stones:** Types, Characteristics, Uses, Quarrying of Stones, Dressing Operations and Preservation of Stones. **Fine and Coarse Aggregates:** Types, Properties, Classification, Uses, Recycled and Sustainable Aggregates and List of Tests on Aggregates (No Laboratory Conduction). **Masonry Units:** Classification of Bricks and Blocks, Their Properties and Applications, Manufacturing Procedure of Masonry Units (Flow Chart), Tests on Masonry Units (No Laboratory Conduction), Defects in Bricks and Remedial Measures. **Text Book 1:** Ch 1: 1.1–1.5, Ch 2: 2.1–2.8, Ch 3: 3.1–3.7 Ch 4: 4.1–4.6.	
Module – 2	**08 Hrs**
Cement, Mortar and Concrete: Cement: Types, Properties, Applications, Hydration of Cement, Role of Water In Hydration, Cement Manufacturing Process (Flow Chart) and Field and Laboratory Test Procedures. **Mortar:** Types, Preparation, Properties, Applications, Admixtures and Additives Used In Mortar and Cement-Based Materials and their Applications in Buildings. **Concrete:** Production of Concrete, Grades of Concrete, Mix Proportions (No Mix Design), Factors Affecting The Properties of Concrete, Differences Between Fresh and Hardened Concrete, Tests on Concrete (No Laboratory Conduction) and Admixtures. **Text Book 1:** Ch 5: 5.1–5.8, Ch 6: 6.1–6.6, Ch 7: 7.1–7.10.	
Module – 3	**08 Hrs**

Timber, Metals, Glass, Paints, and Other Building Materials: Timber : Classification, Properties, Defects, Seasoning, Preservation and Fire-Resistant Treatment.
Wood: Veneers, Plywood, Fibre Boards, Particle Boards, Block Boards and Batten Boards.
Steel and Metals: Types, Important Properties, Uses, List of Tests On Steel Reinforcement Bars, Aluminium and Copper. **Glass:** Types, Properties and Uses.
Gypsum: Sources, Properties and Uses. **Plastics:** Properties and Uses. **Paints:** Purpose, Types, Technical Terms, Ingredients, Defects, Preparation and Application on New and Old Plastered Surfaces, Wooden Surfaces and Steel Surfaces. **Adhesives:** Types and Applications. **Bitumen:** Types, Properties and List Of Tests. **Roofing and Flooring Tiles:** Types and Uses.
Text Book 1: Ch 8:8.1–8.9, Ch 9: 9.1–9.6, Ch10: 10.1–10.5, Ch 11:11.1–11.4, Ch12:12.1–12.4.

Module – 4	**08 Hrs**

Modern Building Materials: Fiber-Reinforced Composites, Geosynthetics, Gypsum Boards, GFRG (Glass Fiber Reinforced Gypsum) Panels, Low-E Glass, Aluminum Composite Panels (ACP), Recycled Steel and Smart Materials Such as Smart Glass, Self-Healing Materials, Shape Memory Alloys (SMA), Phase Change Materials (PCM) and Self-Cleaning Coatings.
Text Book 1: Ch 13: 13.1–13.8, Ch 14: 14.1–14.6.

Module – 5	**08 Hrs**

Building Components and Construction Practices: Foundations: Soil Investigation, Functions of Foundations, Types of Foundations, Selection of Foundations, Shallow and Deep Foundations and Requirements of a Good Foundation.
Plastering: Purpose of Plastering, Plastering Materials, Types of Plastering, Plastering Mortars, Methods of Plastering, Properties of Good Plaster and Defects In Plastering.
Flooring: Types of Flooring (Ceramic, Marble, Granite and Industrial Flooring), Flooring Materials and Methods of Laying.
Roofing: Types of Roofs, Wooden and Steel Trusses, Weatherproofing and Damp-Proofing.
Lintels and Building Elements: Lintels, Chajja, Canopy and Balcony.
Temporary Structures and Formwork: Scaffolding, Shoring, Underpinning, Formwork for RCC members and Slip Forming.
Text Book: 1 Ch 15: 15.1–15.7, Ch 16: 16.1–16.5, Ch 17: 17.1–17.8, Ch 18: 18.1–18.6.

Topics for Self learning	
Module – 1	Examine the sustainable use of natural stones in construction.
	Explore automation techniques in brick and block manufacturing.
Module – 2	Analyze the applications and advantages of Ready-Mix Concrete (RMC).
	Investigate the use of waste materials in cement and concrete production.
Module – 3	Evaluate the properties and performance of fire-resistant building materials.
	Study recent trends in glass and aluminum applications in building.
Module – 4	Assess green building materials and their environmental, economic, and social benefits.
	Explore the applications of nanotechnology in construction materials.
Module – 5	Examine prefabricated building components and their role in modern construction.
	Analyze common building defects, their causes, and preventive measures.

Course Outcomes: After completing the course, the students will be able to	
CO1	Illustrate the properties and applications of building materials, stones, aggregates and masonry units in construction.
CO2	Apply the concepts of cement, mortar and concrete for building construction.
CO3	Analyse the properties and suitability of timber, steel, glass, gypsum, plastics, paints and other building materials.
CO4	Evaluate modern building materials and smart materials for sustainable

	construction.
CO5	Select appropriate building components, foundations, flooring, roofing and construction practices for building works.

Text Books	
1	Building Materials, S.K. Duggal, 5th Edition, New Age International, 2022, ISBN: 9788122436814
2	Building Construction and Materials, B.C. Punima, Ashok Kumar Jain &Arun Kumar Jain, 11thEdition, Laxmi Publications, 2021, ISBN: 9789380386668
3	Engineering Materials, Surendra Singh, 2nd Edition, Vikas Publishing, 2021, ISBN: 9789325982290

Reference Books	
1	Construction Materials, S.C. Rangwala, 29th Edition, Charotar Publishing, 2020, ISBN: 9789380358863
2	Materials for Civil and Construction Engineers, Michael S.Mamlouk & John P. Zaniewski, 4th Edition, Pearson, 2020,ISBN:9780135079255
3	Building Construction Materials and Techniques, Purushotham Raj,1st Edition, Pearson Education India,2016,ISBN-13:978-9332544796
4	Properties of Concrete, A.M. Neville, 6th Edition, Pearson Education, 2022, ISBN: 9781292179888

Web links and Video Lectures (e – Resources)	
1	**Functions of Buildings:**https://nptel.ac.in/courses/105102088
2	**Cement, Mortar and Concrete what is the difference:** https://www.youtube.com/watch?v=YWBE_A1RePo
3	**Top Building Materials Built our World:** https://www.youtube.com/watch?v=RAfhrfDUFYM

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2				2					1	2	3
CO2	3	2	2			2					1	2	3
CO3	3	2	2			2					2	2	3
CO4	3	3	3			2					2	2	3
CO5	3	3	2			2					3	2	3

Semester: III						
Surveying **Stream: CV**						
Course Code	**:**	1BCV305		**Credits**	**:**	3
Hours/Semester (L:T:P:SL)	**:**	42:0:0:48		**CIE**	**:**	50 Marks
Total Hours	**:**	90		**SEE**	**:**	50 Marks
Course Type	**:**	PCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basic Mathematics
Knowledge on Fundamental Concepts	Dimension Units, Distance, Angles, Area & Volume
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Apply knowledge of mathematics to understand the principles of both traditional and modern surveying.
CLO2	Utilize surveying equipment's and Modern tools to carry out field surveying.
CLO3	Plot topographical Drawings and construction drawing.
CLO4	Use Total station for data capture, data storage, data transfer.
CLO5	Prepare construction drawing and setting out.

Module – 1	**08 Hrs**
Engineering Surveying: Definition & Importance of Surveying for Civil Engineers. Classifications of Surveying. **Measurement of Distances:** Various Types of Chains and Tapes, Laser Distance Meter, Distance Measuring Wheel and Electronic Distance Measurement. **Compass Surveying:** Types of Compasses, Uses, Bearings (WCB and QB). **Plane Table Surveying:** Equipment and Accessories, Terms, Setting up the Plane table. **Text Book 1:** Ch 1: 1.1 – 1.4, Ch 3: 3.1-3.8, Ch 4 : 4.1-4.3, Ch 5: 5.1-5.5, Ch 11: 11.1-11.4	
Module – 2	**08 Hrs**
Levelling: Terms Used in Levelling, Setting Up of Dumpy Level and Theodolite. Differential Levelling By Plane of Collimation Method, Rise and Fall Method Using Dumpy Level/Theodolite. **Theodolite Surveying:** Terms used in Theodolite Surveying. Measurement of Horizontal angles by Repetition Method and Vertical angles with Theodolite. (No numerical problems) **Tachometric Surveying:** Basic principle, Distance and Elevation Equation for Horizontal and Inclined line of Sight in Fixed Hair Method and Basic Numerical Problems. **Text Book 1:** Ch 6: 6.1 – 6.6, Ch 9: 9.1-9.10,Ch 22: 22.1-22.6	
Module – 3	**08 Hrs**
Curves: Types of Curves, Components of Simple Curve, Setting Out of Simple By Theodolite (Rankine's Method). (Numericals Only On Simple Curves) **Total Station Surveying:** Features, Parts, Accessories and Advantages of Total Station. Measurement of Horizontal Angle, Vertical Angle, Distance, Slope, Vertical Distance, Multiple Angles With Total Station. **Text Book 1:** Ch 12: 12.1 – 12.5, Ch 13 :13.1 –13.5, 13.8 **Text Book 2:** Ch 10: 10.1 – 10.3	
Module – 4	**08 Hrs**

Coordinate Survey with Total Station: Measurement of Coordinates, Creating Job Files, Importance of Back Sight Data, Coordinate Data Recording. Data Transferring, Data Refinement using Total Station.
Contours: Definition, Terms Used, Characteristics of Contours and Applications of Contours in Civil Engineering Practice.
Text Book 2: Ch 10: 10.6
Text Book 1: Ch 9: 9.14 – 9.15, Ch10:10.1 – 10.5, Ch 20: 20.7

Module – 5	**08 Hrs**

GPS Surveying: Introduction, Absolute and Differential Positioning with GPS. Types of GPS Receivers, Applications.
Surveying with Drone: Introduction, Features of Photogrammetric Mapping Method, Types Of Drones and Sensors. Parts of Drones and Specifications. Flight Planning (Altitude, Overlap, Resolution),Regulatory Compliance (DGCA Norms),Data Capture – Processing – Output, Limitations (Weather, Obstacles, Permissions)
Modern Survey: LiDAR, RADAR, SONAR Basics. Remote Sensing and GIS -Application in Surveying.
Text Book 2: Ch 6: 6.1 – 6.3, Ch 8: 8.15-8.17,Ch 9: 9.3 – 9.14

Topics for Self learning	
Module – 1	Explore mobile applications used for basic field measurements and navigation.
	Identify sources of errors in compass surveying and methods of correction.
Module – 2	Explore practical applications of tacheometry in hilly terrain surveys.
	Investigate common field errors during levelling and angle measurements.
Module – 3	Investigate curve failures and design corrections in transportation projects.
	Review case studies where Total Stations improved survey efficiency.
Module – 4	Investigate contour maps of local areas and identify terrain features.
	Explore Digital Terrain Models (DTM) and Digital Elevation Models (DEM).
Module – 5	Study recent DGCA regulations governing drone operations in India.
	Explore the use of RADAR and SONAR in hydrographic and underground surveys.

Course Outcomes: After completing the course, the students will be able to	
CO1	Interpret surveying methods and instruments for measuring distances and directions in practical scenarios.
CO2	Analyze field data obtained from levelling, theodolite, and tacheometric surveys to interpret ground features.
CO3	Apply surveying principles to solve problems related to curves and total station measurements.
CO4	Analyze coordinate survey data, contour information, and field measurements obtained using Total Station for engineering application.
CO5	Identify the suitability of modern surveying tools in solving real-world engineering problems.

Text Books	
1	Surveying Volume 1,Dr. B C Punmia, Ashok Kumar Jain & Arun Kumar Jain, , Laxmi Publications , 18th Edition, 2024, ISBN:978-8170088530.
2	Surveying Volume 2, Dr. B C Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publications , 17th Edition, 2023,. ISBN:978-8170088837.
3	Surveying Volume 1, S K Duggal, McGraw Hill Education, 5th Edition, 2019 , ISBN-13: 978-9353167509.

Reference Books	
1	Surveying Volume – 1, Dr. K R Arora, Standard Book House, 17th Edition, 2019, ISBN-13:978-8189401238
2	Dr. K R Arora, Surveying Volume – 2, Standard Book House, 15th Edition, 2018, ISBN-13: 978-8189401245
3	Surveying and Levelling, N NBasak, McGraw Hill Education, 2nd Edition, 2017 , ISBN:978-9332901537
4	Surveying Volume 2, S K Duggal, McGraw Hill Education, 5th Edition, 2020 , ISBN-13: 978-9353167516.

Web links and Video Lectures (e – Resources)	
1	**The Global Positioning System and Its Applications:** https://www.civil.iitb.ac.in/~dhingra/ce152_files/ce152_MNK.pdf
2	**Drone Surveying: How it Works and What Accuracy to Expect:** https://wingtra.com/surveying-gis/surveying-e-book/?srsltid=AfmBOopV65nbZetCzUtVg2TkvtyC9wL7sGSxSaFEWMXmNxqgW2wi3NeD
3	**An Introduction to Remote Sensing and GIS:** https://aabsys.com/an-introduction-to-remote-sensing-and-gis/

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3											2	
CO2	3	2	3			2						2	2
CO3	3	3			3	2					2	2	2
CO4	3	2	3			2						2	2
CO5	3	2			3	2					2	2	2

Semester: III						
Computer Aided Building Planning and Drawing Lab **Stream: CV**						
Course Code	**:**	1BCVL306		**Credits**	**:**	1
Hours/Semester (L:T:P:SL)	**:**	0:0:28:02		**CIE**	**:**	50 Marks
Total Hours	**:**	30		**SEE**	**:**	50 Marks
Course Type	**:**	PCCL		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Engineering Graphics / Engineering Drawing
Knowledge on Fundamental Concepts	Units, Scale, Basic construction elements (foundation, slab, beam, staircase)
Knowledge on Connected Tools (If any)	Solid edge

Course Learning Objectives: This course will enable the students to	
CLO1	Demonstrate the use of computer-aided drafting tools for preparing engineering drawings.
CLO2	Develop skills in preparing engineering drawings digitally.
CLO3	Interpret the graphical representation of building components in engineering drawings.
CLO4	Prepare plans, elevations, and sectional drawings.
CLO5	Interpret and apply building bye-laws in drawing preparation.

List of Experiments	
1.	Introduction to Autodesk AutoCAD – Interface, Basic Commands and Drawing Setup. Planning Aspects as Per Building Bye Laws And NBC Guidelines-2016.
2.	Drawing Standard Sections of Stone Masonry Foundation, Isolated Footing, Combined Footing, Raft,Pile Foundations.
3.	Drawing Standard Sections of Lintel and Chajja.
4.	Drawing Standard Sections of Paneled Doors and Windows.
5.	Drawing Standard Sections of RCC Column, Shear Wall.
6.	Drawing Standard Sections of RCC Beam (Cantilever &Continuous Beam).
7.	Drawing Standard Sections of RCC One Way And Two-Way Slabs.
8.	Drawing Plan and Section of Staircases: Dog-Legged Staircase &Open Well Staircase, Waist Slab, Folded Plate.
9.	Drawing Plan, Elevation and Sectional Elevation of Single Story Residential Building (Approval Plan Using Building Bye-Laws).As Per NBC
10.	Drawing Plan, Elevation and Sectional Elevation of Double Story Residential Building .

Suggested Open Ended Experiment	
1.	Prepare detail drawing showing water supply system and sanitary system for residential building.

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply AutoCAD tools, commands, and drafting standards to prepare engineering drawings.
CO2	Prepare sectional drawings of civil engineering components, including foundations, RCC elements, doors, windows, lintels, chajjas, and staircases.
CO3	Develop building plans, elevations, and sections in accordance with NBC-2016 and relevant Building Bye-laws.
CO4	Apply engineering drafting standards and conventions in civil engineering drawings.
CO5	Develop residential building service drawings for electrical, water supply, and sanitary systems following standard engineering practices.

Text Books	
1	Engineering Drawing – N. D. Bhatt,55th Edition, Charotar Publishing House Pvt. Ltd., Anand, India,2025,ISBN:978-93-85039-80-5.
2	Building Drawing – M. G. Shah, C. M. Kale, S. Y. Patki,6th Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi,2019,ISBN9780074638767.
3	Building Planning and Drawing,S.S Bhavikatti,Caitanya Book House,2014, ISBN-10: 9382332561.

Reference Books	
1	AutoCAD for Engineers & Designers – Sham Tickoo, BPB Publications, New Delhi, 2023,ISBN:978-93-89898-98-9.
2	Introduction to AutoCAD for Civil Engineering Applications – Nighat Yasmin, Edition, Wiley, India, 2023, ISBN: 978-1630576202.
3	Computer-Aided Civil Engineering Drawing – Rohit Manglik, 1st Edition, EduGorilla Publication,2024,ISBN -978-9371633642
4	Building Planning and Drawing, MV Chitwadagi and S S Bhavikatti, Dream Tech Press,2019, ISBN-13:978-9389307085

Web links and Video Lectures (e – Resources)	
1	**An Introduction to CAD:** https://youtu.be/EgKc9L7cbKc
2	**AutoCAD Tutorials For Beginners & Students:** https://www.autodesk.com/in/campaigns/autocad-tutorials?utm
3	**Plan and section dog legged stair & open well stair: https://www.youtube.com/watch?v=APhVFtrQm5k**

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2				3			2	2		2	2	1
CO2	2				3	3	2	2	2		2	2	2
CO3	2	2			3	3	2	2	2		2	2	2
CO4	2				3	3	2	2	2		2	2	2
CO5	2	2			3	3	3	2	2		2	2	2

Semester: III						
Digital Tools for Engineering Analysis **Stream: CV**						
Course Code	**:**	1BCVL307A		**Credits**	**:**	1
Hours/Semester (L:T:P:SL)	**:**	0:0:28:02		**CIE**	**:**	50 Marks
Total Hours	**:**	30		**SEE**	**:**	50 Marks
Course Type	**:**	AEC		**SEE Duration**	**:**	2 Hours

Prerequisites:	
Courses	Engineering Mathematics, Basics of Programming
Knowledge on Fundamental Concepts	Algebra, matrices, equations and statistics
Knowledge on Connected Tools (If any)	Computer knowledge

Course Learning Objectives: This course will enable the students to	
CLO1	Apply spreadsheet tools for engineering calculations and data organization.
CLO2	Distinguish statistical analysis and visualization of civil engineering datasets.
CLO3	Develop programs for solving engineering and numerical problems.
CLO4	Apply programming tools for graphical visualization of civil engineering data.
CLO5	Solve practical problems in civil engineering using computational tools.

Sl.No.	**List of Experiments**
1.	Introduction to Spreadsheet.
2.	Create a Spreadsheet For Unit Conversions Used In Civil Engineering Such as Length, Area, Volume, Density And Pressure.
3.	Develop A Spreadsheet To Calculate Area and Volume of Structural Components Such as Beams, Slabs, Columns and Footings.
4.	Prepare a Spreadsheet For Material Quantity Estimation For Concrete Based on Given Mix Proportions and Required Volume.
5.	Perform Statistical Analysis of Rainfall Data (Mean, Variance, Standard Deviation) Using Spreadsheet Functions.
6.	Plot Rainfall Intensity Versus Time Graphs and Interpret the Results Using Spreadsheet Charts (Hydrograph Analysis).
7.	Analyze Traffic Flow Data Using Spreadsheets by Plotting Traffic Volume Versus Time and Determining Peak Traffic Conditions.
8.	Introduction to Numeric Computing Platforms.
9.	Perform Vector and Matrix Operations In Numeric Computing Platforms and Solve Systems of Linear Equations.
10.	Develop a Program to Compute Stress and Strain From Given Experimental Data. Plot The Stress-Strain Curve and Perform Curve Fitting and Regression Analysis.
11.	Write a Program to Compute Shear Force and Bending Moment For A Simply Supported Beam Subjected to Point Loads.
12.	Generate Contour Plots For Terrain Elevation Data Using Numeric Computing Platforms to Visualize Surface Topography.

Open Ended Experiments	
1	Develop a spreadsheet to calculate and compare the quantities of concrete required for different beam dimensions.
2	Create a program to solve and visualize the deflection profile of a simply supported beam for varying spans and loads.

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply spreadsheet tools to perform basic civil engineering calculations.
CO2	Apply statistical functions and graphical tools in spreadsheets to analyze civil engineering datasets.
CO3	Analyze the engineering problems and develop programs.
CO4	Analyze and visualize civil engineering data using graphical tools.
CO5	Develop solutions using numeric computing platforms and spreadsheets for solving practical civil engineering problems.

Text Books	
1	Microsoft Excel Data Analysis and Business Modelling, Wayne L. Winston, 5th Edition, Microsoft Press, 2019,ISBN: 978-1509305889.
2	MATLAB: A Practical Introduction to Programming and Problem Solving, Stormy Attaway, Butterworth-Heinemann, 5th Edition, 2021, ISBN: 978-0128154793.
3	MATLAB Programming for Engineers, Stephen J. Chapman, Cengage Learning, 6th Edition, 2019, ISBN: 978-1337676819.

Reference Books	
1	Microsoft Excel Data Analysis for Dummies, Stephen L. Nelson, wiley,2018,ISBN-13 : 978-8126573455
2	Microsoft Excel Data Analysis and Business Modelling, Wayne L. Winston, 5th Edition, Microsoft Press, 2019, ISBN: 978-1509305889.
3	Engineering Problem Solving with MATLAB, Delores M. Etter, 4th Edition, Pearson Education, 2013, ISBN: 978-0136083580.
4	Applied Numerical Methods with MATLAB for Engineers and Scientists, Steven C. Chapra, 4th Edition, McGraw-Hill Education, 2018, ISBN: 978-0073397962

Web links and Video Lectures (e – Resources)	
1	**Get More Done With Excel:** https://support.microsoft.com/en-us/excel
2	**Microsoft 365 Overview:** https://learn.microsoft.com/en-us/training/m365/
3	**MS Excel Tutorials:** https://www.geeksforgeeks.org/excel/excel-tutorial/

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2			3			3			1	2	1
CO2	2	3		3	3			3			1	2	2
CO3	2	3	2		3	2		3	2		1	3	2
CO4	2	2		3	3			3			1	2	2
CO5	3	3	3	2	3	2		3	2		2	3	3

Semester: III						
Structural Behaviour Visualization Lab **Stream: CV**						
Course Code	**:**	1BCVL307B		**Credits**	**:**	1
Hours/Semester (L:T:P:SL)	**:**	0:0:28:02		**CIE**	**:**	50 Marks
Total Hours	**:**	30		**SEE**	**:**	50 Marks
Course Type	**:**	AEC		**SEE Duration**	**:**	2 Hours

Prerequisites:	
Courses	Engineering Mechanics, Strength of Materials, Structural Analysis
Knowledge on Fundamental Concepts	Types of Loads and Types of Failures
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Analyze the response of materials and structural components under different loading conditions such as tension, compression, shear, bending, and torsion.
CLO2	Analyse deformation patterns and failure modes of structural members.
CLO3	Evaluate analytical results with experimental observations.
CLO4	Apply experimental techniques to measure displacement, strain, and stress.
CLO5	Analyse test results to evaluate structural performance and safety levels.

List of Experiments	
1.	Introduction To Structural Visualization Lab.
2.	Verification of Maxwell- Betti Theorem.
3.	Determination of Beam Flexural Rigidity.
4.	Deflection of Pin-Jointed Truss.
5.	Buckling Behaviour of Columns.
6.	Portal Frame Behaviour Under Load.
7.	Influence Line For Beams.
8.	Two-Hinged Arch Experiment.
9.	Strain Measurement Using Strain Gauges.
10.	Dynamic Response of Structural Models..
11.	Structural Visualization Using FEM Software.

Suggested Open Ended Experiment	
1.	Evaluate structural member behaviour using AI-based analysis techniques.
2	Investigate the effect of support conditions on structural behaviour.
3	Analyze load paths in structures through experimental investigation

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze laboratory methods and tests for evaluating structural behavior and response.
CO2	Apply suitable methods to measure deflection, strain, and load in structural components.
CO3	Analyze structural behavior under different loading conditions, including bending, buckling, and vibration phenomena.
CO4	Evaluate analytical accuracy by comparing theoretical and experimental results.
CO5	Analyze experimental, analytical, and numerical (FEM/AI-based) methods to assess structural performance.

Text Books	
1	Basic Structural Analysis, Reddy, C.S., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 3rd edition, 2011. · ISBN: 9780070702769
2	Strength of Materials, R K Bansal, Revised Edition, 2018, Laxmi Publications (P) Ltd. New Delhi, India, ISBN: 9788131808146.
3	Theory of Structures, Pandit and Gupta, Vol-1, Tata McGraw Hill, New Delhi, 1st Edition, 2017, ISBN: 978007463493

Reference Books	
1	Mechanics of Materials, James M. Gere & Stephen P. Timoshenko, PWS Publishing Company / Van Nostrand Reinhold, 6th Edition, 2000, ISBN: 9780534405116.
2	Structural Analysis, R.C. Hibbeler, Pearson Education, 12th edition, 2020, ISBN: 9780134610677.
3	Theory of Structures, S. Ramamrutham, Dhanpat Rai Publishing Company Private Limited, New Delhi, 9th Edition, 2014, ISBN-13: 978-9384378103.
4	Structural Analysis, S S Bhavikatti, Vikas Publishing house Pvt. Ltd, New Delhi, 5th Edition, 2021, ISBN-13: 978-81-947519-8-4.

Web links and Video Lectures (e – Resources)	
1	**Data Visualization Lab Experiment 1:** https://youtu.be/OBfk0l4rwFc?si=DdPYIpYNDKI9w7xq
2	**Data Visualization Lab Experiment 2 :** https://youtu.be/3unuGZjkxoY?si=3aGbQFInPVYKevUq
3	**Data Visualization Lab Experiment 3 :** https://www.youtube.com/watch?v=8gCIjtENYEc

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2				2	2	2	2		1	2	2
CO2	2	2				2	2	2	2		1	2	
CO3	2	2				2	2	2	2		1	2	2
CO4	2	2		1	1	2	2	2	2		1	2	2
CO5	2	2		2	1	2	2	2	2		1	2	

Semester: III						
Python Programming Applications Lab **Stream: CV**						
Course Code	**:**	1BCVL307C		**Credits**	**:**	1
Hours/Semester (L:T:P:SL)	**:**	0:0:28:02		**CIE**	**:**	50 Marks
Total Hours	**:**	30		**SEE**	**:**	50 Marks
Course Type	**:**	AEC		**SEE Duration**	**:**	2 Hours

Prerequisites:	
Courses	Python for Beginners, Geodetic Surveying, Strength of Materials, Fluid Mechanics
Knowledge on Fundamental Concepts	If, else, elif, for, while,break, functions
Knowledge on Connected Tools (If any)	Jupyter

Course Learning Objectives: This course will enable the students to	
CLO1	Learn dimension conversion.
CLO2	Apply python programming language to surveying concepts.
CLO3	Analyze Fluid mechanics using python programming.
CLO4	Apply python programming language to the strength of materials concept.
CLO5	Analyze the SF, BM and Euler's buckling load.

List of Experiments	
1.	Write a program to convert distance in meter into centimeter, millimeter and force in kN into N and vice versa.
2.	Build a python program to calculate the slope (gradient) and bearing between the two points using coordinates.
3.	Develop a python program to calculate total rise and fall. Take input elevation of points from the user.
4.	Build a python program to calculate the contour interval.
5.	Write a python program to calculate Volume of Cube, Cylinder and Sphere.
6.	Develop a python program to calculate density and discharge of water.
7.	Develop a python program to calculate the specific gravity of material.
8.	Develop a python program to calculate the Reynolds number and classify the type of flow.
9.	Develop a python program to calculate shear stress and bending stress.
10.	Develop a menu driven python program to calculate thermal stresses for various conditions.
11.	Develop a python program to calculate the maximum shear force and maximum bending moment of the simply supported beam subjected to point load and UDL.
12.	Develop a menu driven python program to calculate the Euler's buckling load for various end conditions.

Suggested Open Ended Experiment	
1	Evaluate flood risk through rainfall data analysis.
2	Design and develop a Python program for M20 concrete mix design.
3	Investigate beam response under various loading conditions.

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply Python programming concepts to perform basic engineering unit conversions.
CO2	Apply surveying principles to determine slope, bearing, contour interval, and rise & fall using coordinate-based computational methods.

CO3	Analyse fluid mechanics concepts to calculate density, discharge, specific gravity, and Reynolds number for flow analysis.
CO4	Apply strength of materials principles for shear stress, bending stress, and thermal stresses under different conditions using programming tools.
CO5	Analyse shear force, bending moment, and Euler's buckling load for beams and columns under various loading and end conditions.

Text Books	
1	How to think like a computer scientist: learning with python 3,Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, Green Tea Press, Wellesley, Massachusetts, 3rd Edition, 2020.
2	Python Essentials You Always Wanted to Know: Beginner's Guide to Python Programming, Data Structures, Data Analytics with Hands-On Coding Exercises,Swan peters,2024, ISBN-13:978-1636512938

Reference Books	
1	Automate the Boring Stuff with Python : Practical Programming for Total Beginners,Al Sweigart, No Starch Press, 2nd Edition, 2022, ISBN-13:9781593279929.
2	Programming with Python, Kyla McMullen, Elizabeth Matthews and June Jamrich, Parsons, 2023, Boston :Cengage, ISBN: 9780357710845.

Web links and Video Lectures (e – Resources)	
1	**Automate the Boring Stuff with Python :** https://automatetheboringstuff.com/
2	**How to Think Like a Computer Scientist:** https://media.readthedocs.org/pdf/howtothink/latest/howtothink.pdf

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3								2	2		2	
CO2	3	2						2	2	2	1	2	
CO3	3	2			3			2	2	2	1	2	
CO4	3	2			3			2	2	2	1	2	
CO5	3	2			3			2	2	2	1	2	

Semester: III
Engineering Geology Lab
Stream: CV

Course Code	**:**	1BCVL307D		**Credits**	**:**	1
Hours/Semester (L:T:P:SL)	**:**	0:0:28:02		**CIE**	**:**	50 Marks
Total Hours	**:**	30		**SEE**	**:**	50 Marks
Course Type	**:**	AEC		**SEE Duration**	**:**	2 Hours

Prerequisites:	
Courses	Basic Civil Engineering materials
Knowledge on Fundamental Concepts	Earth Materials, Engineering Materials, and Introductory Geological Concepts
Knowledge on Connected Tools (If any)	Topographic Maps, Geological Maps

Course Learning Objectives: This course will enable the students to	
CLO1	Explore the physical properties and characteristics of rock-forming and economic minerals through hand specimen studies.
CLO2	Examine rocks based on their mineral composition, texture, and structure..
CLO3	Apply geological principles to solve borehole, strike-dip, thickness, and outcrop problems relevant to engineering projects.
CLO4	Apply geological principles to interpret maps, cross-sections, strike, dip, faults, and unconformities.
CLO5	Evaluate geological structures, landforms, and rock suitability for engineering applications.

List of Experiments	
1.	Study of Physical Properties and Identification of Rock Forming Minerals - Quartz, Feldspar, Garnet, Mica &Talc, Asbestos, Calcite, Gypsum, Etc.
2.	Study of Physical Properties And Identification of Economic Minerals- Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, Etc.
3.	Identification of Igneous Rocks- Types of Granites, Dolerite, Granite Porphyry, Basalt, Pumice Etc.
4.	Identification of Sedimentary Rocks-Sandstone,Lime Stone, Shale, Laterite, Breccia Etc
5.	Identification of Metamorphic Rocks- Gneiss, Slate, Schist, Marble, Quartzite Etc.
6.	Determination of Subsurface Behavior of Rocks, their Attitude Related to Foundation, Tunnels, Reservoirs and Mining. Triangular and Square Methods.
7.	Dip and Strike Problems. Determine Apparent Dip and True Dip.
8.	Calculation of Vertical, True Thickness and Width of the Outcrops. (3 Methods)
9.	Study of Topo sheets and Interpretation, Extraction of Drainage Basin and Its Morphometric Analysis.
10.	Interpretation and Drawing of Sections For Geological Maps Showing Tilted Beds, Faults, Unconformities Etc.
11.	Interpretation of Satellite Images. (2 Satellite Images)

Open Ended Experiments	
1	**Assessment of Local Building Stones**: Collect rock samples from nearby construction sites and evaluate their suitability for foundations, road metal, and masonry based on physical properties.
2	**Mineral Resource Survey of the Study Area**: Identify economically important minerals in the region and analyze their engineering and industrial significance.
3	**Groundwater Potential Assessment**: Analyze drainage patterns, lithology, and structural features from maps and satellite imagery to identify potential groundwater zones.
4	**Structural Analysis of Field Outcrops**: Measure strike and dip at a field location and interpret possible geological history and engineering implications.
5	**Study of Quarry Sites and Aggregate Quality**: Visit a quarry and evaluate rock quality for use as aggregates in concrete and pavement construction.

6	**Environmental Impact of Mining Activity**: Examine geological and geomorphological changes caused by mining and recommend sustainable practices

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify and classify rock-forming and economic minerals based on their physical properties and economic significance.
CO2	Examine and distinguish rocks using megascopic characteristics such as texture, structure and mineral composition.
CO3	Apply geological concepts to determine strike, dip, apparent dip, true dip, rock attitude, subsurface behavior and outcrop dimensions in engineering geological problems.
CO4	Analyze topographical maps, drainage basins, satellite images, geological maps, faults, folds, and unconformities to interpret geological conditions.
CO5	Evaluate geological structures, geomorphological features, and rock suitability for civil engineering applications based on field and laboratory investigations.

Text Books	
1	Engineering Geology for Civil Engineers, Venkat Reddy D I,IBH Publishing Co. Pvt. Ltd, 2017, ISBN-13: 978-9385998881.
2	A Textbook of Geology, Mukerjee P.K., 13th Edition, World Press Pvt., Ltd., Calcutta, 2006, ISBN-13: 978-8184241273.
3	Engineering Geology for Civil Engineers, Vargese, Prentice Hall India Learning Private Limited, 2012, ISBN-13:978-8120344952

Reference Books	
1	Principles of Engineering Geology and Geotechnics, Dimitri P Krynine, William R Judd, CBS publishers and Distributors, 2003, ISBN-13: 978-8123904513.
2	A textbook of Engineering Geology, ChennaKesavulu, Mac Millan India Ltd, 1996, ISBN-13: 978-0333923644.
3	Geology For Civil Engineers, Gribble, 2nd edition,Taylor & Francis, 2015,ISBN-13 : 978-1032793283
4	Handbook of Engineering Geology for Geologists and Civil Engineering Prefessionals,Vinay kumar, CBS Publishers and Distributors Pvt . Ltd.,2017, ISBN-13:978-9386478016

Web links and Video Lectures (e – Resources)	
1	**Introduction to Engineering Geology:** https://youtu.be/aTVDiRtRook
2	**Physical Properties of Mineraks:** https://youtu.be/MWs5id2_-sY
3.	**Groundwater potential zone mapping Using GIS and remote sensing: https://www.youtube.com/watch?v=3nU2NXu-sMQ**

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3							3	2			3	3
CO2	3	2			3			3	2			3	3
CO3	3	2						3	2			3	
CO4	3	2	3	3				3	2			3	
CO5	3	2	3			3		2	2		3	3	3

Semester: III					
Community Project					
Course Code	**:**	1BCP308	**Credit**	**:**	1
Hours/Semester (L:T:P:SL)	**:**	0:0:0:30	**CIE**	**:**	50 Marks

Total Hours	**:**	30	**SEE**	**:**	50 Marks
Course Type	**:**	SDC	**SEE Duration**	**:**	2 Hours

Course Learning Objectives: This course will enable the students to	
CLO1	Foster civic engagement and social responsibility by immersing students in communities to identify societal, welfare, and sustainability challenges.
CLO2	Apply engineering principles and interdisciplinary thinking to analyze community problems and design practical solutions.
CLO3	Develop professional skills in teamwork, project management, and effective communication with diverse community stakeholders.
CLO4	Instill an understanding of sustainable development, engineering ethics, and the long-term socio-economic impacts of technical interventions.
CLO5	To cultivate ethical engineering practices and an appreciation for sustainable development by analyzing the long-term impacts of technology on society.

Restrictions and professional conduct:

Community / Societal Projects shall remain academic, socially responsible, technically focused, and politically neutral. Students and faculty shall maintain professionalism, ethical conduct, public respect and institutional integrity while interacting with communities, public groups, organizations and stakeholders.

Students and faculty shall avoid the following during project execution:

- Association with political party activities, campaigns or propaganda.
- Participation in activities that may disturb communal harmony, public order or institutional reputation.
- Use of the project platform for personal, political, ideological or commercial promotion.
- Disrespectful, discriminatory or unethical interaction with community members or stakeholders.

Projects must also recognize constraints related to cost, resources, environment and safety, and stakeholder behavior/cooperation/acceptance when planning and implementing activities.

SET OF PROJECT ACTIVITIES (TW/SL = 30 HOURS)

Methods for project identification:

Students may identify the project topic using one or more of the following methods:

- Interaction with local rural or urban stakeholders such as local leaders, corporation/municipality personnel, NGOs, panchayat representatives, etc.
- Review of issues highlighted in print and electronic media, and social networks (WhatsApp, Facebook, X, Instagram, etc.).
- After selecting a broad topic, students shall collect data, conduct a feasibility survey, estimate timelines and resources, approximate expenditure, and then define the problem statement and objectives clearly.

List of Project Topics and Engineering Outcomes:

The following structured sequence of activities is to be carried out during the semester:

Sl. No.	Project title	Measurable engineering outcome	Mapped POs	SDGs
1	Rural and urban water conservation and management systems	Prepare a site-specific water-saving plan, estimate water demand–supply gap, and propose a feasible conservation intervention with quantified savings.	PO1, PO2, PO3, PO4, PO10, PO11	SDG 6, SDG 11, SDG 12

2	Waste management and recycling	Conduct waste audit, classify waste streams, and design a segregation/recycling workflow with measurable reduction in mixed waste.	PO2, PO3, PO4, PO6, PO8, PO10	SDG 11, SDG 12, SDG 13
3	Afforestation	Identify a degraded area, prepare plantation layout, and demonstrate survival-rate tracking and maintenance schedule for saplings.	PO2, PO3, PO4, PO6, PO7, PO11	SDG 11, SDG 13, SDG 15
4	Biogas generation and power generation	Estimate organic waste availability, size a small biogas system, and document expected gas output or energy yield.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 7, SDG 11, SDG 12
5	DPR for solar power rural plant	Prepare a DPR with load assessment, panel sizing, cost estimate, and projected energy generation and payback.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 7, SDG 9, SDG 11
6	DPR for electrification of village/tribal community	Map unserved/underserved households, propose electrification layout, and estimate coverage, losses, and implementation cost.	PO1, PO2, PO3, PO4, PO10, PO11	SDG 7, SDG 9, SDG 10
7	DPR for rural drainage system	Survey drainage bottlenecks, develop a drainage layout, and estimate runoff handling capacity and flood-risk reduction.	PO1, PO2, PO3, PO4, PO6, PO10	SDG 6, SDG 9, SDG 11
8	Sustainability and environmental health projects	Assess local environmental health issues and propose interventions with measurable improvement in hygiene, safety, or resource use.	PO2, PO3, PO4, PO6, PO7, PO8	SDG 3, SDG 6, SDG 11, SDG 12
9	Plastic free campaigns	Measure plastic usage before and after awareness intervention and report percentage reduction or behavioural change.	PO2, PO3, PO6, PO7, PO8, PO10	SDG 11, SDG 12, SDG 13
10	Health and nutrition awareness	Conduct baseline and post-program awareness survey and document improvement in awareness score or	PO2, PO6, PO7, PO8, PO9, PO10	SDG 2, SDG 3, SDG 11
	Societal	Identify a community health need	PO2,	SDG 3,

11	projects involving health wellness	and develop an awareness/service module with measurable participation and feedback outcomes.	PO3, PO6, PO8, PO9, PO10	SDG 11, SDG 17
12	Air quality monitoring system	Collect air-quality data, compare with reference limits, and present trends along with possible mitigation suggestions.	PO2, PO3, PO4, PO5, PO6, PO10	SDG 3, SDG 11, SDG 13
13	Plastic waste reduction campaign	Track collection, segregation, and replacement actions, and quantify reduction in plastic waste generation or littering.	PO2, PO3, PO6, PO7, PO8, PO10	SDG 11, SDG 12, SDG 13
14	Urban greening projects	Prepare greening plan, identify planting locations, and assess environmental benefits such as shade, aesthetics, or heat mitigation.	PO2, PO3, PO4, PO6, PO7, PO11	SDG 11, SDG 13, SDG 15
15	Smart agriculture solution	Design a low-cost monitoring or irrigation support solution and estimate improvement in water use efficiency or crop support.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 2, SDG 6, SDG 9
16	Smart irrigation system	Estimate crop water requirement, propose control logic, and quantify water savings compared with conventional irrigation.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 2, SDG 6, SDG 12
17	Youth mentoring programmes	Deliver a structured mentoring activity and measure participation, engagement, and skill/awareness improvement.	PO6, PO8, PO9, PO10, PO11	SDG 4, SDG 10, SDG 17
18	Adult education	Conduct learner-needs assessment, prepare instructional content, and measure improvement in basic literacy or numeracy indicators.	PO6, PO8, PO9, PO10, PO11	SDG 4, SDG 10, SDG 17
19	Food security initiatives / cold storage system	Estimate storage need, design a simple cold-chain concept, and document reduction in spoilage or wastage.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 2, SDG 9, SDG 12
20	Human rights awareness with legal systems	Prepare and deliver an awareness module and assess increase in legal awareness and access-to-rights understanding.	PO6, PO7, PO8, PO9, PO10	SDG 5, SDG 10, SDG 16

21	House tax collection through digital media	Develop a simple digital workflow or awareness support and measure improvement in compliance, convenience, or response time.	PO2, PO3, PO4, PO5, PO10, PO11	SDG 9, SDG 11, SDG 16
22	Use of application / application program	Build or demonstrate a useful community app and measure usability, adoption, or efficiency improvement.	PO1, PO3, PO4, PO5, PO9, PO10	SDG 9, SDG 11, SDG 17
23	Creation of Panchayat library	Plan the library model, catalogue resources, and measure usage, accessibility, or participation outcomes.	PO6, PO8, PO9, PO10, PO11	SDG 4, SDG 10, SDG 11, SDG 17

Suggested Learning Resources:

Textbooks:

1. Phadke, N. D. Community Engagement and Social Innovation. 1st ed., Oxford University Press, New Delhi.
2. Garg, N. R. Project-Based Learning in Engineering Education. 1st ed., Pearson India Education Services, Noida.
3. Gupta, A. and P. Singh. Service Learning and Community Projects. 1st ed., McGraw-Hill Education (India), New Delhi.
4. Wilson, G. Practical Guide to Community Development Projects. 2nd ed., Routledge, London.

Reference books:

1. NPTEL courses on Project-Based Learning and Social Innovation.
2. SWAYAM courses on community engagement and sustainability.
3. UN Sustainable Development Goals portal: https://sdgs.un.org
4. MyGov India and local civic body portals for community initiatives.
5. YouTube resources on design thinking, social innovation, and community service learning.

NGO and government field-action case studies related to sanitation, water, health, education, and environment.

Web links and Video Lectures (e-Resources):

1. NPTEL courses on Engineering Geology (IIT Roorkee, IIT Kharagpur).
2. NPTEL courses on Soil Mechanics and Foundation Engineering (IIT Delhi, IIT Bombay).
3. Virtual Labs – Geotechnical Engineering Virtual Lab (IIT Kanpur): https://vlab.co.in
4. Geological Survey of India (GSI) – Maps, reports, and publications: https://www.gsi.gov.in
5. YouTube channels: Civil Engineering Essentials, The Engineering Classroom (soil mechanics experiments).
6. American Society of Civil Engineers (ASCE) – Geotechnical resources and standards

Teaching Learning Process:

The suggested TLP for Community / Societal Project is as follows:

Week	Teaching–Learning Activity	Faculty Role	Student Activity	Output / Evidence
1	Course introduction,	Explain course scope, rules,	Understand course requirements and	Team list,

	objectives, ethics, conduct, and assessment briefing	rubrics, and expected deliverables	form teams	course plan
2	Community problem identification and topic selection	Guide topic framing and feasibility	Identify local issues through discussion and observation	Shortlisted project topic
3	Stakeholder interaction and preliminary survey	Demonstrate survey methods and stakeholder engagement	Collect initial data from community/users	Survey notes, interview record
4	Problem statement and objective formulation	Review and refine problem statement	Prepare problem statement, scope, and objectives	Approved problem statement
5	Literature/case study review and baseline analysis	Suggest relevant references and examples	Study existing solutions and compare approaches	Baseline analysis summary
6	Project planning and role assignment	Help teams organize tasks, timeline, and responsibilities	Plan activities, divide roles, and prepare schedule	Work plan / Gantt chart
7	Feasibility analysis and solution brainstorming	Check technical feasibility and practicality	Generate possible engineering solutions	Solution alternatives sheet
8	Selection of final solution and design approach	Review final concept and design logic	Finalize concept, methods, and expected outcome	Concept note / design outline
9	Data processing / calculations / sizing / mapping	Support computations and technical review	Analyze data, perform calculations, prepare maps/charts	Technical analysis sheet
10	Prototype / model / audit / DPR / app development	Monitor progress and correct technical issues	Develop the selected output	Working model / draft DPR / map / app
11	Testing, refinement, and implementation planning	Evaluate technical correctness and improvements	Test prototype or validate proposal with users	Test results / revised output
12	Field implementation / demonstration / awareness activity	Facilitate community interaction and documentation	Conduct implementation or demonstration	Photos, attendance, implementation record

13	Documentation of outcomes, feedback, and impact	Review report structure and completeness	Compile findings, stakeholder feedback, and observations	Draft report
14	Presentation preparation and viva practice	Conduct mock presentation and feedback	Prepare slides/poster and rehearse	Presentation deck
15	Final presentation, submission, and reflection	Evaluate performance using rubrics	Present project, submit report, reflect on learning	Final report, presentation, viva

Assessment structure:

A. Continuous Internal Evaluation (CIE) – 50 marks

- Students, in batches of 3–4, shall undertake at least one project (or a combination of two related activities) aiming, as far as possible, at a logical implemented or implementable outcome.
- CIE will be conducted by a departmental committee (HoD/nominee, guide and one senior faculty) using the following rubrics totaling 50 marks:

CIE pass requirement:

- A student shall secure a minimum of 20 marks out of 50 in CIE to become eligible to appear for SEE.
- Students who fail to earn the required CIE marks may be given additional opportunities before closure of the semester; no re-doing of CIE is permitted after the end of the semester.

B. Semester End Examination (SEE) – 100 marks (scaled to 50)

- Examination duration: 2 hours.
- Maximum examination marks: 100 scaled to 50
- The SEE shall be conducted batch-wise by two examiners, one faculty from the same department and one from a different department appointed by the Principal.

SEE pass requirement and overall passing rule:

- For a pass in SEE, a student shall secure minimum 35 marks out of 100.
- For declaration of a pass grade, the sum of CIE marks (out of 50) and scaled SEE marks (out of 50) shall be ≥ 40; otherwise, the student is awarded grade F (Fail).

CIE Rubric — Continuous Internal Evaluation (Total 50 marks):

Criterion	Weight (marks)	Excellent (Full marks)	Good	Fair	Needs Improvement
Problem identification & Relevance to society/industry/community	8	Problem is clearly identified with strong evidence of societal relevance and well-defined scope.	Problem is Relevant and scope is clear with adequate supporting evidence.	Problem defined but justification or evidence is weak.	Problem unclear or not relevant; little/no supporting evidence.
Formation of problem statement; Engineering approach, innovation & feasibility	10	Problem statement is precise; approach is sound, innovative and clearly feasible.	Problem statement adequate; approach feasible with minor gaps.	Problem statement partial; approach feasibility is marginal.	Problem statement missing or approach not feasible.

Interaction with stakeholders; Data collection, analysis & interpretation	8	Thorough stakeholder engagement; data collection is comprehensive ; analysis is well-interpreted	Good engagement ; data and analysis adequate with minor gaps.	Limited engagement; data incomplete and analysis superficial.	Little/no stakeholde r contact; insufficient or no data/ analysis.
Project documentation; Clarity, organization & problem-solving demonstrated	10	Documentation is complete, well-organized, analytical, and shows strong problem-solving	Documentation complete and clear with some analytical content.	Documentation on basic with omissions; problem-solving limited.	Documentation missing/poorly organized; no clear problem-solving.
Communication& Presentation skills	6	Presentation is confident, structured, and answers queries fully; visuals effective.	Presentation clear and satisfactory; responds to most queries.	Presentatio n acceptable but lacks clarity or confidence; weak responses.	Presentatio n poor or absent; unable to respond.
Contribution & Benefit to society (impact, sustainability)	8	Clear, demonstrable societal benefit and sustainability realistic path to implementation.	Benefit plausible; sustainability considered with minor gaps.	Limited or unclear societal benefit; sustainability not well addressed.	No evident benefit or sustainability; project not community-oriented.

SEE Rubric — Semester End Examination (Will be conducted for 100 marks; later scaled to 50 marks):

Criterion	Weight (marks)	Excellent (Full marks)	Good	Fair	Needs Improvement
Problem identification & Relevance to society/industry/ community	16	Problem and relevance are articulated clearly with strong evidence and context.	Problem relevance clear with reasonable evidence.	Problem stated but evidence/ context weak.	Problem poorly defined or irrelevant.
Formation of problem statement; Engineering approach, innovation & feasibility	20	Problem statement is precise; approach demonstrates engineering depth, novelty and feasibility.	Approach is technically sound and Feasible with minor limitations.	Approach basic; limited technical depth or feasibility concerns.	No viable engineering approach or infeasible plan.
Interaction with stakeholders; Data collection, analysis &	16	Excellent stakeholder engagement; rigorous data collection and	Good engagement and acceptable	Superficial data collection and limited	Inadequate or no data; poor analysis.

interpretation		insightful analysis.	analysis.	analysis.	
Project documentation; Clarity, technical rigor & problem-solving demonstrated	20	Report is comprehensive, technically rigorous, and demonstrates systematic problem-solving.	Report is complete and technically correct with minor gaps.	Report lacks technical depth or has notable omissions.	Report missing key elements or technically incorrect.
Communication, Presentation & Viva-voce responses	12	Candidate presents expertly, defends work persuasively and answers all queries correctly.	Good presentation and satisfactory answers to most queries.	Presentation adequate but fails to answer some technical questions.	Poor presentation and unable to defend work.
Contribution & Benefit to society; Impact assessment & sustainability	16	Clear, evidence-based assessment of social impact and Sustainability with scaling recommendations	Reasonable impact discussion and sustainability considerations.	Limited evaluation of impact or sustainability.	No coherent assessment of impact or sustainability

Course Outcomes: After completing the course, the students will be able to	
CO1	Investigate a community to identify unmet needs, sustainability gaps, or technical challenges using structured empathy, observations, and interviews.
CO2	Design a practical, engineering-based solution that directly addresses the identified community issue.
CO3	Apply engineering concepts and project management principles to execute and deploy the designed solution within community constraints.
CO4	Assess the social, environmental, ethical, and economic impacts of the project to ensure sustainable development and community welfare.
CO5	Function effectively individually or in a team, and communicate project progress and outcomes clearly to technical evaluators and community members.

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	3				3					
CO2	3		3		2	2					
CO3	3			2	2					3	
CO4						3	3				2
CO5								3	3		2

Semester: III					
National Service Scheme (Common to the Branches)					
Course Code	**:**	1BNS309	**Credit**	**:**	PP

Hours/Semester (L:T:P:SL)	**:**	0:0:0:28	**CIE**	**:**	100 Marks
Total Hours	**:**	28	**SEE**	**:**	-
Course Type	**:**	NCMC	**SEE Duration**	**:**	-

Prerequisites:	
Courses	**---**
Knowledge on Fundamental Concepts	Basic understanding of social responsibility, environmental awareness, community welfare, sustainable development, ethics, teamwork, and communication skills.
Knowledge on Connected Tools (If any)	Basic use of smartphones, internet, digital communication tools (email, WhatsApp, Google Forms), presentation software (PowerPoint/Canva), video recording tools, and office productivity software (MS Word/Google Docs) for documentation and report preparation.

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the community, identify its needs and problems, and apply knowledge to develop practical and sustainable solutions for community development and welfare.
CLO2	Develop social and civic responsibility, leadership, teamwork, communication, and community participation skills through collaborative learning, extension activities, and community engagement.
CLO3	Demonstrate ethical values, democratic attitudes, responsible citizenship, and a commitment to social service while contributing effectively to community welfare and nation-building

Activity– 1	**10 Hrs**
Sustainable Rural Development Organic Farming, Indian Agriculture, Sustainable Water Management, Agricultural Marketing	
Activity – 2	**09 Hrs**
Environmental Sustainability and National Development Waste Management, 5R's, Swachh Bharat, Digital India, Skill India, Atmanirbhar Bharat, Make in India, etc.	
Activity – 3	**09 Hrs**
Community Outreach and Social Responsibility Women's Information Club, Rural Awareness Programs, Social Connect and Responsibilities	

Topics for Self learning	
Activity – 1	Sustainable agriculture, organic farming, and water conservation practices.
	Digital marketing, e-NAM, and rural development strategies for farmers.
Activity – 2	Waste management, the 5R principles, and environmental conservation.
	Government flagship initiatives and the role of NSS volunteers in nation-building.
Activity – 3	Women empowerment, digital literacy, and community leadership.
	Rural outreach, public awareness campaigns, social responsibility, and volunteerism.

Pedagogy – Guidelines, it may differ depending on local resources available for the

study as well as environment and climatic differences, location and time of execution

Sl. No.	Topic	Group Size	Location	Activity Execution	Reporting	Evaluation of the Topic
1.	Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.	May be individual or team	Farmers land/Villages/ roadside / community area/ College campus etc.....	Site selection /proper consultation/Continu ous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
2.	Waste management– Public, Private and Govt organization, 5 R's.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations /Government Schemes officers/ campus etc.....	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
3.	Setting of the information imparting club for women leading to contribution in social and economic issues.	May be individual al or team	Women empowerment groups/ Consulting NGOs & Govt. Teams / College campus etc.....	Group selection/pro per consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

Plan of Action (Execution of Activities for 3rd Semester)

Sl. No.	Practice Session Description
1.	Lecture session by NSS Officer
2.	Selection of topic, Commencement of activity and its progress
3.	Execution of Activity
4.	Case study based Assessment, Individual performance
5.	Sector wise study and its consolidation
6.	Video based seminar for 10 minutes by each student At the end of semester with Report.

- In the 3rd semester, each student should do activities according to the scheme and syllabus.
- At the end of the semester student performance has to be evaluated by the NSS Officer for the assigned activity progress and its completion.
- At the end of the 3rd semester, consolidated report of all activities compiled report should be submitted as per the instructions.

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate social responsibility by identifying and analyzing environmental and societal issues and proposing practical, sustainable solutions for community development.
CO2	Implement and evaluate government and community-driven initiatives to address societal challenges and promote community welfare.
CO3	Apply ethical values, teamwork, leadership, and civic responsibility while participating effectively in social service, community engagement, and nation-building activities.

Assessment Details for CIE (100 Marks)

Weightage	**CIE- 100 Marks**
Selection of Topic, Commencement of activity and its progress	**40 Marks**
Case study based Assessment	**20 Marks**
Sector wise study and its consolidation	**20 Marks**
Video based seminar for 10 minutes by each student at the end of semester with Report	**20 Marks**
Total Marks for the course in the semester	**100 Marks**

Suggested Learning Resources:	
Books:	
1	NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2	Government of Karnataka, NSS cell, activities reports and its manual.
3	Government of India, NSS cell, Activities reports and its manual.

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1						3	2	2	1		3
CO2						3	3	2	1		3
CO3						3	3	3	3		3

Semester: III						
Physical Education **Common to All Branches**						
Course Code	**:**	1BPE309		**Credits**	**:**	PP

Hours/Week(L:T:P:SL)	**:**	0:0:0:28		**CIE**	**:**	**100 Marks**
Total Hours	**:**	28		**SEE**	**:**	-
Course Type	**:**	NCMC		**SEE Duration**	**:**	-

Course Learning Objectives: This course will enable the students to	
CLO1	Develop awareness about personal health, wellness, and the importance of an active lifestyle through pre-fitness evaluation and orientation.
CLO2	Improve general physical fitness through structured training in strength, speed, and warm-up exercises.
CLO3	Acquire sport-specific skills and techniques in traditional games such as Kabaddi or Kho-Kho through practical sessions.

Module – 1	**4 Hrs**
Orientation A. Lifestyle. B. Health & Wellness. C. Pre-Fitness test.	
Module – 2	**4 Hrs**
General Fitness & Components of Fitness A. Warming up (Free Hand exercises). B. Strength – Push-up / Pull-ups. C. Speed – 30 Mtr Dash.	
Module-3	**16 Hrs**
Specific games (Any one to be selected by the student) A. Kabaddi – Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus. B. Kho-Kho – Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.	

Topics for Self learning	
Module – 1	Healthy lifestyle practices, balanced nutrition, sleep and stress management, and awareness of personal health and wellness.
Module – 2	Components of physical fitness, principles of fitness training, benefits of regular exercise, and methods for monitoring personal fitness levels.
Module – 3	Rules and regulations of Kabaddi and Kho-Kho, history and development of indigenous sports, basic game strategies, sportsmanship, teamwork, and prevention of common sports injuries.

Course Outcomes: After completing the course, the students will be able to	
CO1	Describe the principles of physical education, health, nutrition, fitness and wellness for maintaining a healthy and active lifestyle.
CO2	Perform exercises, sports, yoga, and recreational activities to improve physical

	fitness, mental well-being, teamwork and sportsmanship.
CO3	Apply health, fitness, and wellness practices to promote lifelong well-being and develop foundational skills for sports and fitness careers.

Scheme and Assessment for auditing the course and Grades:

Sl. No.	Activity	Marks
1.	Participation of student in all the modules.	20
2.	Quizzes – 2, each of 15 marks.	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students.	50
	Total	**100**

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						3	2				2
CO2						3	2	3	3		2
CO3						3	3	2	2	2	3

Semester: III					
Yoga **Common to All Branches**					
Course Code	**:**	1BYO309	**Credit**	**:**	PP

Hours/Semester (L:T:P:SL)	**:**	0:0:0:28	**CIE**	**:**	100 Marks
Total Hours	**:**	28	**SEE**	**:**	---
Course Type	**:**	NCMC	**SEE Duration**	**:**	---

Prerequisites:	
Courses	**--**
Knowledge on Fundamental Concepts	• Basic understanding of physical fitness, health and personal hygiene. • Awareness of body posture, breathing, and general wellness practices.
Knowledge on Connected Tools (If any)	**--**

Course Learning Objectives: This course will enable the students to	
CLO1	Explain the fundamental concepts, principles, and significance of Yoga for physical and mental well-being.
CLO2	Demonstrate Suryanamaskara and the fundamental techniques of selected Yogasanas by following proper procedures and precautions.
CLO3	Practice different categories of Yogasanas to promote flexibility, strength, balance, and overall wellness.

Module - 1	**04 Hrs**
Introduction and Foundations of Yoga: Introduction to Yoga: Origin, history, meaning, definitions, schools, aims and objectives of Yoga, Importance of prayer in Yoga practice, Foundations of Yogic Practice: Yogic practices for positive health, rules for practitioners, misconceptions about Yoga, and differences between yogic and non-yogic practices. **Text Book 1: Ch. 1**	
Module - 2	**05 Hrs**
Suryanamaskara and Fundamentals of Asanas: Suryanamaskara (Sun Salutation): Prayer, meaning, need, importance, benefits, 12-count structure, and practice of two rounds, Introduction to Asanas: Meaning, need, importance, classification, general techniques, precautionary measures, and benefits. **Text Book 1: Ch. 2, 3**	
Module - 3	**05 Hrs**
Types and Practice of Asanas: Sitting Asanas: Padmasana, Vajrasana, Standing Asanas: Vrikshasana, Trikonasana, Prone Lying Asanas: Bhujangasana, Shalabhasana, Supine Lying Asanas: Utthitadvipadasana, Ardhahalasana. **Text Book 1: Ch. 4**	

Topics for Self learning	
Module – 1	Different Schools of Yoga (Hatha, Raja, Karma, Bhakti, Jnana Yoga) and their applications

Module – 2	Scientific benefits of Suryanamaskara and Yoga for stress management and lifestyle disorders
Module – 3	Advanced Asanas, precautions, common mistakes, and role of Yoga in daily life .

Course Outcomes: After completing the course, the students will be able to	
CO1	Summarize the philosophy, objectives, and health benefits of Yoga and yogic practices.
CO2	Demonstrate correct techniques while performing Suryanamaskara and selected Yogasanas safely.
CO3	Practice appropriate Yogasanas for improving physical fitness, mental concentration and healthy living.

Text Book	
1	The Illustrates Light on Yoga, BKS Iyengar, Element Publishers, ISBN-978-8172236069, 2005
2	Light on Yoga, BKS Iyengar, Thorsons Publishers, ISBN: 978-8172235017, 2006

Reference Books	
1	Teaching Methods for Yogic practices by Dr. M L Gharote & Dr. S K Ganguly, 4th Edition, Kaivalyadhama Publishers, ISBN-10 : 9788189485245
2	Yoga Instructor Course hand book published by SVYASA University, Bengaluru
3	Yogapravesha in Kannada by Ajitkumar
4	Yoga for Children –step by step – by Yamini Muthanna

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/playlist?list=PLzF4lOyPf_Z9yQ_Gphjh1wZ5fEhMg6hmP
2	https://www.youtube.com/playlist?list=PLOzRYVm0a65cCcY4qKX5MIyJxBt7hJgQY
3	https://youtu.be/KB-TYlgd1wE
4	https://youtu.be/aa-TG0Wg1Ls

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						2	1				2
CO2						3	2	1			2
CO3						3	2	2			3

Semester: III					
Music **Common to All Branches**					
Course Code	**:**	1BMU309	**Credit**	**:**	PP

Hours/Semester (L:T:P:SL)	**:**	0:0:0:28	**CIE**	**:**	100 Marks
Total Hours	**:**	28	**SEE**	**:**	---
Course Type	**:**	NCMC	**SEE Duration**	**:**	---

Prerequisites:	
Courses	Familiarity with school-level cultural or music activities is beneficial
Knowledge on Fundamental Concepts	Basic awareness of vocal music and musical instruments.
Knowledge on Connected Tools (If any)	Metronome or Tala application for rhythm practice. Audio playback device (mobile phone/laptop) for listening to compositions.

Course Learning Objectives: This course will enable the students to	
CLO1	Interpret the foundational concepts of Indian classical music
CLO2	Analyze the evolution and structure of Shruthi, Nada, Swara, Laya, Raga, Tala and Mela systems.
CLO3	Illustrate various types of Carnatic compositions such as Geethe, Jathi, Swara, Swarajathi, Varna, Krithi and Thillana, along with the basics of the notation system

Module – 1	**05 Hrs**
Preamble Contents of the curriculum intended to promote music as language to develop an analytical, creative and intuitive understanding. For this the student must experience music through study and direct participation in improvisation and composition. **Text Book 1:** V-1 Ch. 1-3	
Module – 2	**05 Hrs**
Origin of the Indian Music Origin and Evolution of the Indian music system, understanding of Shruthi, Nada, Swara, Laya, Raga, Tala, Mela. Notations of swara , tala and practice. **Text Book 1:** V-1 Ch. 3-4	
Module – 3	**04 Hrs**
Compositions Introduction to the types of composition in Carnatic Music – Geethe, Jathi, Swara, Swarajathi, Varna, Krithi and Thillana, Notation System. **Text Book 2:** Ch. 4-7	

Topics for Self learning	
Module – 1	Evolution of Carnatic and Hindustani music – similarities and differences
	Role of music in Indian Culture, Yoga, and Meditation
Module – 2	Study of popular Carnatic ragas and their emotional significance
	Importance of Gamakas in Carnatic Music
Module – 3	Life cycle of a Carnatic concert and the sequence of musical compositions
	Identification and practice of different ragas

Course Outcomes: After completing the course, the students will be able to	
CO1	Comprehend the fundamental concepts to promote and develop Indian music
CO2	Analyse the evolution of Indian music and key concepts like Shruthi, Swara, Raga and Tala

CO3	Apply the basic Carnatic compositions using standard notation.

Text Books	
1	South Indian Music – Vol. I to VI, Prof. P. Sambamoorthy, 2019thEdition,2021 .The Indian Music Publishing House, Chennai, ASIN : B093Y3TL52 Chapters:1,2,3,4
2	A Textbook of Carnatic Music, Dr. S. Bhagyalekshmy, 4th Edition ,2008,CBH Publications , ISBN 81 85 381 50 Chapters:4,5,6,7
3	Karnataka Sangeetha Charitre, Dr. V. S. Sampathkumaracharya, Kannada University, Hampi

Reference Books	
1	History of South Indian (Carnatic) Music (From Vedic Times to the Present) , R Rangaramanuja ayyangar ,2019 edition ,Vipanchi charitable trust publisher ISBN: 9788187723158.
2	Music of India, B. Chaitanya Deva, 2nd edition , 1995 Munshiram Manoharlal Publishers. ISBN-10 : 8121501954
3	Essentials of Musicology in South Indian Music, Prof. S. R. Janakiraman, 2013 Edition, Asian Educational Services
Web links and Video Lectures (e – Resources)	
1	https://youtu.be/DZA_cSb0Zo8?si=55M6QAC2T8VqZN39
2	https://www.youtube.com/live/RfM4lAJQgCc?si=xfK0b6exvkBujugr
3	https://youtu.be/DZA_cSb0Zo8?si=55M6QAC2T8VqZN39

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3		1		1		1	1	1		1
CO2	3		3	1	2	1	2	1	1		1
CO3	3		3	1	2	1	2	1	1		1

Semester: III					
National Cadet Corps - I **Common to All Branches**					
Course Code	**:**	1BNC309	**Credit**	**:**	PP

Hours/Semester (L:T:P:SL)	**:**	0:0:0:28	**CIE**	**:**	100 Marks
Total Hours	**:**	28	**SEE**	**:**	---
Course Type	**:**	NCMC	**SEE Duration**	**:**	---

Prerequisites:	
Courses	Nil
Knowledge on Fundamental Concepts	-
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the aim, organisation and philosophy of training of the NCC, and appreciate the importance of national integration
CLO2	Acquire general awareness of disaster management and civil affairs, and the cadet's role during emergencies
CLO3	Gain general knowledge of social awareness, community development and the youth's role in nation building

Module – 1	**05 Hrs**
The NCC and National Integration – General Awareness The NCC: Aims and Objectives of NCC; Organisation, Training and NCC Song; Incentives for NCC Cadets. National Integration: Religions, Culture, Traditions and Customs of India; Importance and Necessity of National Integration. Freedom Struggle and Nationalist Movement in India; National Interests, Objectives, Threats and Opportunities. Problems/Challenges of National Integration; Unity in Diversity; National Integration Council; Contribution of Youth in Nation Building.	
Module – 2	**05 Hrs**
Disaster Management and Civil Affairs – General Awareness Civil Defence Organisation and the National Disaster Management Authority (NDMA); Types of Emergencies/Natural Disasters. Fire Services and Fire Fighting (general awareness); Essential Services and their Maintenance during a disaster. Assistance during Natural/Other Calamities (Flood/Cyclone/Earthquake/Accident); Setting up of Relief Camps. Collection and Distribution of Aid Material during Disaster Management.	
Module – 3	**04 Hrs**
Social Awareness and Community Development – General Awareness Basics of Social Service and its Need; Rural Development Programmes (MGNREGA, SGSY, NSAP, etc.); Role and Contribution of NGOs. Contribution of Youth towards Social Welfare; Civic Responsibilities; Family Planning (general awareness). Causes and Prevention of HIV/AIDS and Role of Youth; Counter Terrorism (general awareness); Corruption. Social Evils – Female Foeticide, Dowry, Child Abuse/Trafficking; Right to Information (RTI) and Right to Education (RTE).	

Topics for Self learning	
Module – 1	Reading on the aims/objectives and organisation of NCC from the Cadet's Handbook; a short note on any one national integration theme (e.g., Unity in Diversity)
Module – 2	Case-note on a recent natural disaster and the civil administration's/NDMA's response; awareness reading on relief-camp organisation
Module – 3	Short write-up on one rural development programme (e.g., MGNREGA); awareness reading on RTI/RTE provisions

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain the aim, organisation and philosophy of training of the NCC and describe the importance of national integration
CO2	Describe the role of civil defence, NDMA and the cadet during disaster management and relief operations
CO3	Explain the elements of social awareness, community development programmes and the youth's civic responsibilities

Text Books	
1	Cadet's Handbook – Common Subjects (SD/SW), Directorate General NCC, Ministry of Defence, Government of India, Edition dated 06 May 2013 (or latest edition).
2	NCC Handbook for 'A', 'B' and 'C' Certificate Examinations, Upkar Prakashan, Latest Edition.

Reference Books	
1	NCC General Knowledge and Current Affairs, Arihant Publications, Latest Edition.
2	National Disaster Management Authority (NDMA) – guidelines and awareness publications, Latest Edition.
3	NCC Directorate/Group HQ training literature and circulars, as issued from time to time.

Web links and Video Lectures (e – Resources)	
1	Directorate General National Cadet Corps – https://www.nccindia.gov.in/
2	National Disaster Management Authority – https://ndma.gov.in

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1						3		2	2		
CO2						3	2	2			
CO3						3		2	2		

Semester: III						
Competency Enhancement Course-1 **Common to All Branches**						
Course Code	:	1BCE310		**Credits**	:	PP
Hours/Week (L:T:P:SL)	:	14:0:0:14		**CIE**	:	**100 Marks**
Total Hours	:	28		**SEE**	:	-
Course Type	:	NCMC		**SEE Duration**	:	-

Prerequisites:	
Courses	Fundamentals of Mathematics & English
Knowledge on Fundamental Concepts	Arithmetic operations, fractions, decimals, and elementary algebra. comprehension of basic English
Knowledge on Connected Tools (If any)	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Gain a strong foundation in aptitude skills such as number systems, percentages, ratio & proportion, and interest calculations to improve quantitative reasoning and problem-solving efficiency.
CLO2	Apply Vedic Mathematics techniques and shortcuts for rapid mental calculations, leading to increased accuracy and speed in aptitude-based assessments.
CLO3	Master logical reasoning topics like syllogisms, blood relations, puzzles and seating arrangements to develop structured thinking and effective decision-making skills.
CLO4	Understand and solve problems involving coding-decoding, visual sequences, clocks, calendars and analogies to enhance pattern recognition and reasoning speed.
CLO5	Utilize aptitude and reasoning skills to perform well in competitive exams, campus placements, and workplace situations, contributing to overall academic and professional success.

Module – 1	**6 Hrs**
Introduction to Aptitude and Vedic Mathematics **Understanding Aptitude:** Overview of aptitude skills and their significance in problem-solving and decision-making. Types of aptitude skills commonly assessed in competitive exams and professional settings. **Vedic Mathematics Techniques:** Introduction to Vedic Mathematics for faster and more efficient calculations. Key techniques and shortcuts to improve speed and accuracy in quantitative problems. **Importance of Aptitude Skills:** The role of aptitude in career development and academic success. How strong aptitude skills enhance analytical thinking, logical reasoning, and performance in assessments. **Number System:** Divisibility & Remainder, Multiples & Factors, Integers, LCM & HCF, Complete a number Series, Find the Missing Term and Wrong Term, Simplification, BODMAS Rule, Approximation, Decimals, Fractions, Surds & Indices **Percentage:** Calculation-oriented basic percentage, Profit and Loss, Successive Selling type, Discount & MP, Dishonest Dealings **Text Book 1: Ch 1-11**	
Module – 2	**6 Hrs**

Coding Decoding: Letter Coding, Number Coding, symbol coding Clocks and Calendar **Reasoning: Blood** Relation, Sense of Direction, Arithmetic & Alphabet. Visual Sequence, Visual analogy and classification. **Analytical Reasoning:** Single & Multiple comparisons, Linear Sequencing. **Text Book 3:Ch 2,3,4,6,7,10,12**	
Module-3	**6 Hrs**
Logical Aptitude: Syllogism, Venn-diagram method, Three statement syllogism, Deductive and inductive reasoning. Introduction to puzzle and games organizing information, parts of an argument, common flaws, arguments and assumptions. **Linear Seating Arrangement:** Single or Double rows facing each other or away from each other in the same direction **Circular Seating Arrangement:** Uni- & Bi-directional problems on Circular, Square, Rectangular, Hexagonal tables **Text Book 2:Ch 2,5. R-1- C1-3**	
Module-4	**6 Hrs**
Ratio and Proportion: Simple Ratios, Compound Ratios, Comprehend and Dividend, Direct & Indirect Proportions, Problems on ages, Mixtures & Allegation **Text Book 1:Ch12,13,16**	
Module-5	**6 Hrs**
Partnerships Interest: Simple Interest, Compound Interest, Mixed Interest, Installments. **Text Book 1:Ch 14,15,17,29**	

Topics for Self learning	
Module – 1	Divisibility rules and digital root techniques, Advanced Vedic Mathematics shortcuts (multiplication, squaring, cube roots), Roman numerals and number patterns
	Applications of percentages in banking and business, Practice using online aptitude platforms (IndiaBIX, Testbook, etc.)
Module – 2	Coding-Decoding and Analytical Reasoning, Mirror and water images, Paper folding and paper cutting, Embedded figures and figure completion
	Ranking and ordering problems, Introduction to non-verbal reasoning puzzles
Module – 3	Family tree puzzles, Floor and flat-based puzzles, Scheduling and arrangement puzzles
	Statement–Conclusion and Cause–Effect reasoning, Critical reasoning questions from competitive examinations
Module – 4	Ratio and Proportion, Variation (Direct, Inverse and Joint Variation). Average and weighted average, Time and Work fundamentals
	Pipes and Cisterns (introductory concepts), Real-life applications of ratio and proportion in engineering and finance
Module – 5	Partnership and Interest, Banking concepts related to loans and EMIs, Compound annual growth rate (CAGR)
	Basics of financial literacy and investment, Recurring Deposits (RD) and Fixed Deposits (FD) calculations, Introduction to annuities and financial planning

Course Outcomes: After completing the course, the students will be able to	
CO1	Solve numerical problems using Vedic Math and number systems to boost speed and accuracy.
CO2	Apply logical reasoning to puzzles, syllogisms, seating and classification problems.
CO3	Develop letter, number and symbol patterns and solve visual reasoning tasks.
CO4	Accurately solve problems on percentages, profit-loss, interest, ratios and partnerships.
CO5	Utilize aptitude and reasoning skills to excel in competitive exams and improve employability.

Text Books	
1	Quantitative Aptitude for Competitive Examinations by R.S. Aggarwal Chand Publishing. – 2023.
2	Vedic Mathematics by Bharati Krishna Tirthaji (ISBN- 978-8120801639), Sixteenth Reprint, Published by Motilal Banarsidass Publishers, - 1985
3	Logical and Analytical Reasoning by A.K. Gupta (ISBN- 978-9350127766), 39th Edition, Ramesh Publishing House - 2024

Reference Books	
1	Puzzle Test & Seating Arrangements by K. Kundan (ISBN: 9789394666023),1st Edition, BSC Publishing Company Pvt Ltd. - 2023
2	Logical Reasoning and Data Interpretation for the CAT by Nishit K. Sinha, (ISBN: 978-9353946616) 7th Edition, Pearson Education -2020

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=ZXcULvjpQlM
2	https://www.youtube.com/watch?v=ZXcULvjpQlM
3	https://www.youtube.com/watch?v=OHZ40sOT7mk
4	https://www.youtube.com/watch?v=9UtPPSX_vnk
5	https://www.youtube.com/watch?v=DIbjA3b21ow

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	**3**	**2**									
CO2	**3**	**3**									
CO3	**2**	**3**									
CO4	**3**	**2**									
CO5	**2**	**2**			**1**				**2**		**2**

Semester: III						
Additional Mathematics-I (For Lateral Entry Students of all the Branches)						
Course Code	:	1BMATDIP311		**Credits**	:	PP
Hours/Week (L:T:P:SL)	:	14:0:0:14		**CIE**	:	100
Total Hours	:	28		**SEE**	:	0
Course Type	:	NCMC		**SEE Duration**	:	-

Prerequisites:	
Courses	Basic Mathematics
Knowledge on Fundamental Concepts	Basic differentiation and integration
Knowledge on Connected Tools (If any)	Basic computer knowledge.

Course Learning Objectives: This course will enable the students to	
CLO1	Investigate the concepts of linear algebra to solve systems of linear equations and to determine eigenvalues and eigenvectors.
CLO2	Describe the vector differentiation and integration techniques to analyze scalar and vector Fields.
CLO3	Implement numerical techniques to solve algebraic and transcendental equations, perform interpolation using finite differences and compute numerical integration.

Module – 1	**5 Hrs**
Linear Algebra: Introduction, Rank of a matrix by elementary row operations, Consistency of system of linear equations, Solution by Gauss Elimination method. Eigenvalues and eigenvectors of a square matrix. Problems.	
Module – 2	**6 Hrs**
Vector Differentiation: Differentiation of vector functions. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems.	
Module-3	**6 Hrs**
Numerical Methods-I: Finite differences, Interpolation/extrapolation using Newton's Forward and Backward difference formulae (No derivation), Problems. Solution of polynomial and transcendental equations by Newton–Raphson and Regula–Falsi methods (no derivation), Problems. Numerical Integration: Simpson's 1/3rd rule and 3/8th rule, problems.	
Module-4	**6 Hrs**

Topics for Self learning	
Module – 1	**Applications:** Analyze real-world problems such as traffic flow.
	Self-study: Inverse of a square matrix by Caley- Hamilton theorem.
Module – 2	**Applications**: Velocity and Acceleration in scalar and vector fields.
	Self-Study: Conservation of laws, Analysis of streamlines.

Module – 3	**Applications:** Area, Velocity and population.
	Self-Study: Bisection method, Lagrange's inverse Interpolation**.**

Course Outcomes: After completing the course, the students will be able to	
CO1	Solve the systems of linear equations, determine eigenvalues and eigenvectors and analyze real-world problems such as traffic flow.
CO2	Apply differentiation to solve the vector differentiation and integration techniques to analyze scalar and vector Fields.
CO3	Analyze the numerical techniques to solve algebraic and transcendental equations, perform interpolation using finite differences and compute numerical integration.

Text Books	
1	Higher Engineering Mathematics", B. S. Grewal,44th Edition, 2021, Khanna Publishers,ISBN:978-81-933284-9-1. Chapter. 2, 28,8,29.

Reference Books	
1	Advanced Engineering Mathematics", Kreyszig, E., Kreyszig, H. & Norminton, E. J. (2025). 11th Edition, Wiley India Pvt. Ltd. ISBN: 9789373329949
2	Higher Engineering Mathematics", Ramana, B. V. (2025). 1st Edition, McGraw Hill Education (India) Pvt. Ltd., ISBN: 9780070634190.

Web links and Video Lectures (e – Resources)	
1	http://nptel.ac.in/courses.php?disciplineID=111
2	http://www.class-central.com/subject/math(MOOCs)
3	http://academicearth.org/

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	**3**	**3**	**2**								**1**
CO2	**3**	**3**	**3**								**1**
CO3	**3**	**3**	**2**								**1**
CO4	**3**	**3**	**2**								**1**
CO5	**3**	**3**	**3**								**1**

Institute Vision

Preparing Competent Engineering and Management Professionals to Serve the Society

Institute Mission

- Providing Students with a Sound Knowledge in Fundamentals of their branch of Study.
- Promoting Excellence in Teaching, Training, Research and Consultancy.
- Exposing Students to Emerging Frontiers in various domains enabling Continuous Learning.
- Developing Entrepreneurial acumen to venture into Innovative areas.
- Imparting Value based Professional Education with a sense of Social Responsibility.

Department Vision

Building Competent Civil Engineers with a Societal Perspective

Department Mission

- Providing Conducive Learning Environment focusing on Planning, Analysis, Design and Detailing of Sustainable Infrastructure
- Imparting Training, Research and Consultancy in Collaboration with Research Institutes and Industries
- Equipping Students with Employability Skills through Internships, Industrial Interactions and Field Visits
- Exploring Comprehensive Environmental Aware Solutions for Various Fields of Civil Engineering with Multidisciplinary Approach
- Imbibing Lifelong Learning, Professionalism and Ethics among Civil Engineering Students

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

P.B. No.20, B.B Road,

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