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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
(2024 Scheme)

Core Values

Spiritual, Judicious, Commitment, Integrity, Trustworthy



NATIONAL INSTITUTIONAL RANKING FRAMEWORK 151-300

NAAC A+

QS I-GAUGE GOLD

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

SJC INSTITUTE OF TECHNOLOGY, CHIKKABALLAPURA

An Autonomous Institution Under VTU from 2024 – 2025

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SCHEME OF TEACHING AND EXAMINATION – B.E. – CIVIL ENGINEERING

(Applicable for students admitted from the Academic Year 2024-25 and onwards)

3rd Semester

CIVIL ENGINEERING													
Sl. No.	**Course Code**	**Course Title**	**Course Type**	**TD/ PSB**	**Teaching Hours / Week**			**Examination**					
					L	**T**	**P**	**SEE Duration (Hrs)**	**CIE Mark**	**SEE Marks**	**Total Marks**	**Credits**
1	BMATC301	Mathematics-III for Civil Engineering	ASC	MAT	3	2	0	**3**	**50**	**50**	**100**	**4**
2	BCV302	Strength of Materials	IPCC	Civil	3	0	2	**3**	**50**	**50**	**100**	**4**
3	BCV303	Building Material and Construction Technology	IPCC	Civil	3	0	2	**3**	**50**	**50**	**100**	**4**
4	BCV304	Engineering Survey	PCC	Civil	3	0	0	**3**	**50**	**50**	**100**	**3**
5	BCVL305	Surveying Practice	PCCL	Civil	0	0	2	**3**	**50**	**50**	**100**	**1**
6	BCV306x	ESC/ETC/PLC	ESC	Civil	If the course is a Theory			**3**	**50**	**50**	**100**	**3**
					3	0	0					
					If the course is a Laboratory							
					2	0	2					
7	BSC307	Social Connect and Responsibility	UHV	ANY DEPT	0	0	2	-	**100**	-	**100**	**1**
8	BCV308x	Ability Enhancement Course/Skill Enhancement Course – III	AEC/ SEC	Civil	If the course is a Theory			**1**	**50**	**50**	**100**	**1**
					1	0	0					
					If the course is a Laboratory			**2**				

					0	0	2					
9	BES309	Environmental Studies	MC	Civil	1	0	0	**1**	**50**	**50**	**100**	**1**
10	BNS310	National Service Scheme (NSS)	NCMC	NSS Coordinator	0	0	2	-	**100**	-	**100**	**0**
	BPE310	Physical Education (PE) (Sports and Athletics)		Physical Education Director								
	BYO310	Yoga		Yoga Teacher								
	BMU310	Music		Music Teacher								
11	BCE311	Competency Enhancement Course-1	NCMC	CDCAC		2		-	**100**	-	**100**	**0**
									700	**400**	**1100**	**22**

ASC: Applied Science Course, PCC: Professional Core Course, IPCC: Integrated Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, NCMC: Non Credit Mandatory Course, AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course, L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation.

Engineering Science Course (ESC/ETC/PLC) (Note- Student should opt for the course which should not be similar to the course opted in 1st Year)

Course Code	Course Name	Course Code	Course Name
BCV306A	Smart Urban Infrastructure	BCV306C	Rural, Urban Planning and NBC
BCV306B	Sustainability in Construction	BCV306D	Fire Safety In Buildings

Ability Enhancement Course/Skill Enhancement Course – III

Course Code	Course Name	Course Code	Course Name
BCV308A	Ms Office and Latex	BCV308C	MATLAB For Civil Engineers
BCV308B	Introduction to AI & ML in Civil Engineering	BCV308D	Automation and Robotics in Construction

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering (B.E.) 2024-25 may please be referred.

National Service Scheme /Physical Education/Yoga/Music: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), Yoga and Music with the concerned coordinator / teacher of the course during the first week of 3rd semester. Activities shall be carried out between 3rd semester to the 6th semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, Yoga and Music activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Semester: III						
Mathematics - III for Civil Engineering Stream **Stream: CIVIL**						
Course Code	**:**	**BMATC301**		**Credits**	**:**	4
Hours/Week (L:T:P)	**:**	3:2:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40L		**SEE**	**:**	50 Marks
Course Type	**:**	Integrated		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basic Mathematics
Knowledge on Fundamental Concepts	Curves,Probability,Optimization,Functionals
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	Introduce the fundamentals of optimization and linear programming as effective tools for decision-making in engineering problems.
CLO5	Apply numerical methods to solve real-world problems

Module – 1	**08 Hrs**
Curve fitting and Statistical Analysis: Curve fitting by method of least squares: $y = ax+b$, $y = ax^2 +bx+c$ and $y= ab^x$, Correlation–Karl Pearson's coefficient of correlation, Rank correlation,Regression analysis – lines of regression (without proof)- problems, **Applications:** Prediction of Concrete Strength By using Curve fitting **Text Book 1:** Ch 24: 24.5 - 24.6(1).Ch 25: 25.12-25.16	
Module – 2	**08 Hrs**
Probability: Random Variables (Discrete and Continuous). Probability mass and density functions. Mathematical expectation, Mean and variance. Discrete probability distributions: Binomial, Poisson, Exponential and Normal distributions (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples. **Applications:** Bridge Load Capacity Analysis **Text Book 1:** Ch 26:26.7- 26.10, Ch26.14-26.16,Ch 26.19.	
Module – 3	**08 Hrs**
Calculus of Variations: Variation of a function and a functional.Extremal of a functional, Varational problems, Euler's equation, Standard variational Problems including Geodesics ,minimal surface of revolution.	

Applications Hanging chain problem
Text Book 1: Ch 35: 35.2,35.3,35.4,35.5.

Module – 4	**08 Hrs**

OPTIMIZATION TECHNIQUES

Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method, simplex method ,Relaxation method and Big M method

Applications Structural Design, **Water Resources Management**
Text Book 1: Ch 34: 34.1,34.2,34.3,34.7.

Module – 5	**08 Hrs**

Numerical Methods

Numerical solutions of Second order ordinary differential equations :Picard's method ,Runge-Kutta method of fourth order ,Predictor and corrector methods: Milne's and Adams-Bashforth method (No derivations of formulae).

Applications: Finding approximate solutions of ODE.
Text Book 1: Ch 32:32.1,32.2,32.7,32.9,32.10.

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	**Analyze** the fundamentals of optimization and linear programming as effective tools for decision-making in engineering problems.
CO5	**Apply** numerical methods to solve second-order ordinary differential equations .

Text Books	
1	Higher Engineering Mathematics, B. S. Grewal, 44th Edition, 2021, Khanna Publishers, ISBN: 978-81-933284-9-1.
2	V. Ramana: "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
3	E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

Reference Books	
1	James Stewart: "Calculus" Cengage Publications, 7thEd., 2019.
2	Srimanta Pal & Subodh C.Bhunia: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
3	N.P Bali and Manish Goyal: "A Textbook of Engineering Mathematics" Laxmi Publications, 10thEd., 2022

4	C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 6th Ed., 2017.
5	H.K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S.Chand Publication, 3rd Ed.,2014

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)

CO – PO MAPPING

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

Semester: III						
Strength of Materials						
Course Code	**:**	BCV302		**Credits**	**:**	4
Hours/Week (L: T: P)	**:**	3:0:2		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L +12 P		**SEE**	**:**	50 Marks
Course Type	**:**	IPCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Engineering Mechanics, Engineering Materials,
Knowledge on Fundamental Concepts	Basic knowledge on 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	Explain the stress–strain relationships and evaluate simple and compound stresses and strains in structural members, including the mechanical properties of metals.
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.
CLO6	Explain the stress–strain relationships and evaluate simple and compound stresses and strains in structural members, including the mechanical properties of metals.

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, Principles of Superposition, 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 (No Numerical Problems), Thermal Stress and Strains. **Compound Stresses:** Introduction, State of Stress at a Point, General Two-Dimensional Stress System, Principal Stresses and Principal Planes. **Text Book 1:** Ch 1. **Text Book 2:** Ch 1- 2.	
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, Shear Force and Bending Moment Equations, Development of Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) With Salient Values for Cantilever, Simply Supported and Overhanging Beams for Point Loads, UDL (Uniformly	

Distributed Load), UVL (Uniformly Varying Load) and Couple.
Text Book 1: Ch 4.
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, Problems.
Shear Stress in Beams: Derivation of Shear Stress Intensity Equations, Derivation of Expressions of the Shear Stress Intensity for Rectangular, Triangular and Circular Cross Sections of the Beams. Problems on Calculation of the Shear Stress Intensities at Various Critical Levels of T, I and Hollow Rectangular Cross Sections of the Beam.
Text Book 1: Ch 5 – 6.
Text Book 2: Ch 7- 8.

Module – 4	**08 Hrs**

Deflection of Beams: Definition of Slope, Deflection and Curvature, Sign Conventions, Derivation of Moment- Curvature Equation. Double Integration Method and Macaulay's Method: Slope and Deflection for Standard Loading Cases and for Determinate Prismatic Beams Subjected to Point Loads, UDL, UVL and Couple.
Columns and Struts: Introduction, Short and Long Columns. Euler's Theory; Assumptions, Derivation for Euler's Buckling Load for Different End Conditions, Limitations of Euler's Theory. Rankine-Gordon's Formula for Columns.
Text Book 1: Ch 7, Ch 12.
Text Book 2: Ch 12, 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: Ch16-17.
Text Book 2: Ch 13.

PRACTICAL COMPONENT OF IPCC

Lab Experiments	**12 Lab Sessions**

1. Tension Test on Mild Steel and HYSD Bars.
2. Compression Test on HYSD and Cast Iron.
3. Bending Test on Wood Under Two-Point Loading.
4. Shear Test on Mild Steel – Single and Double Shear.
5. Impact Test on Mild Steel (Charpy and Izod).
6. Torsion Test on Mild Steel Specimens.
7. Hardness Test on Different Types of Materials (Brinnell and Rockwell)

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the Basic Concepts of Stress, Strain and Material Behavior under Axial Loading and Compound Stresses.
CO2	Interpret Shear Forces and Bending Moments In Beams Subjected to various Loading Conditions.
CO3	Evaluate Bending and Shear Stresses in Beams of Different Cross-Sections.

CO4	Compute and Predict Slope and Deflection in Beams using Analytical Methods.
CO5	Design Torsion in Shafts and Evaluate Stresses in Thin and Thick-Walled Cylinders under Internal and External Pressures.

Text Books	
1	"Strength of Materials", B.C Punmia Ashok Jain, Arun Jain, Laxmi Publications 10th Edition,2018.ISBN: 978-8131809259
2	"Strength of Materials", B.S. Basavarajaiah, P. Mahadevappa, University Press (India) Pvt. Ltd., 3rd Edition,2010. ISBN: 9788173714580

Reference Books	
1	"Strength of Materials", S.S. Rattan, McGraw Hill India, 3rd Edition,2017, ISBN-13: 978-9385965517.
2	"A Textbook of Strength of Materials", R.K. Bansal, Laxmi Publications, 5th Edition, 2012, ISBN-13: 978-8131808146.
3	Theory of Structures", S. Ramamrutham, 9th Edition, , Dhanpat Rai Publishing Company Private Limited, New Delhi. 2014. ISBN-13: 978-9384378103.
4	"Elements of Strength of Materials", Timoshenko and Young, East-West Press, 5th Edition, 2011, ISBN:9788176710190.

Web links and Video Lectures (e – Resources)	
1	Strength of Materials web course by IIT Roorkee https://nptel.ac.in/courses/112107146/
2	Strength of Materials video course by IIT Kharagpur https://nptel.ac.in/courses/105105108/
3	Strength of Materials video course by IIT Roorkee https://nptel.ac.in/courses/112107147/18

CO – PO MAPPING

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

Semester: III						
Building Material and Construction Technology						
Course Code	:	BCV303		**Credits**	:	4
Hours/Week(L:T:P)	:	3:0:2		**CIE**	:	50 Marks
Total Hours	:	40 L + 12 P		**SEE**	:	50 Marks
Course Type	:	IPCC		**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Elements of Civil Engineering, Building Materials Engineering Chemistry,
Knowledge on Fundamental Concepts	Earth Sciences, Building Materials etc.
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the geological, physical, and chemical properties of building materials and their relevance in civil engineering applications.
CLO2	Identify the type of foundation, materials and methods used in plastering, flooring, and roofing systems.
CLO3	Gain knowledge of various construction materials including their manufacturing processes and codal specifications
CLO4	Design the concrete mix for the given materials as per IS:10262-2019 provisions and properties of fresh and hardened concrete
CLO5	Analyze the factors affecting durability and performance of construction materials

Module-1	**08 Hrs**
Building Stones: Importance of Geology, Mineralogy in Civil Engineering. Common building stones for construction, Quarrying of stones, properties and their uses, Deterioration of stones. (Self-Study - Preservation of stones, Dressing of stones) **Bricks:** Classification of bricks, Tests on bricks as per codal provision and specifications. (Detailed codal Procedure-Self- Study), (Manufacturing process of bricks (Self-Study), Bonds in Brickwork, English Bond, Flemish Bond, Reinforced brickwork. **Other Masonry Blocks:** Types of blocks, Concrete blocks, Hollow blocks, aerated concrete blocks, Paver blocks, Compressed Mud Blocks, Interlocking Blocks, properties, and Applications of blocks. **Timber**: Natural Timber, Varieties, Characteristics, Defects in Timber. Treatment of Timber, Artificial timber, (quality assessment as per codal provision and specifications (Self Study). **Text Book 1:** Ch1, 3, Ch 15-16. **Text Book 2:** Ch 2, 4, Ch 8-9.	
Module-2	**08 Hrs**
Foundation: Preliminary Investigation of Soil, Different Types of Foundation. **Plastering:** Purpose of Plastering, Materials of Plastering, Lime Mortar, Cement Mortar Different Grades, Workability and Properties, Codal Provisions and Specifications, (Methods of Plastering, Stucco Plastering, Lath Plastering, (Self Study). **Flooring and Roofing:** Types of Flooring: Granolithic, Mosaic, Ceramic, Marble, Granite, Artificial Stones, Industrial Flooring and Requirements (Materials and Method of Laying), Roofing Systems, Components and Main Requirements (Flat Roof (R.C.C.), Sloped Roof (R.C.C. and Tile Roof), Lean to Roof, Wooden Truss (King Post and Queen Post Trusses), Steel Trusses, Weatherproof Course for RCC Roof, Damp Proof Construction. As Per Codal Provision and Specifications (Self Study).	

Lintels: Functions. Chejja, Canopy, Balcony, Shoring, Underpinning, Scaffolding. Form Work, Form Work Details for RCC Columns, Beams, Floors, Slip Forming. (Relevant Codal Provisions and Specifications (Self Study).
Text Book 1: Ch 10, Ch 31- 32.

Module-3	**08 Hrs**

Concrete and Its Constituents: Lime and Cement - Types of Lime, Difference b/w Fat and Hydraulic Lime, Physical and Chemical Properties, Chemical Composition of Portland Cement and Hydration of Cement, Manufacture of Portland Pozzolana Cement, Types of Cements and their Uses, Testing of Cement. Both Field Tests and Laboratory Tests as per Relevant IS Code of Practice and Related Specifications, Supplementary Cementitious Materials.
Fine Aggregate: Properties as Per IS Codal Provision, Sieve Analysis, Specify Gravity, Bulking, Moisture Content, Deleterious Materials. Types and Alternate to Sand, Relevant Specifications. (No Question to be set on Test Procedure (Self-Study).
Coarse Aggregate: Properties as Per IS Code of Practice, Importance of Size, Shape, And Texture. Grading of Aggregates - Sieve Analysis, Specific Gravity, Flakiness and Elongation Index, Crushing, Impact and Abrasion Tests. Types and Alternate to Coarse Aggregates.
Admixtures: Chemical and Mineral Admixtures. Admixtures for Other Applications. Concrete, Types of Concrete and Its Specifications.
Text Book 3: Ch 1 Ch 5 - 7, Ch 12.
Text Book 4: Ch 1 – 3.

Module-4	**08 Hrs**

Mix Design Procedure: Concept of Concrete Mix Design, Variables in Proportioning, Exposure Conditions, Procedure of Mix Design as per IS 10262-2019, Nominal Mix and Design Mix, Numerical Examples of Mix Design. Highlights of Other Methods of Mix Design as per Other Codes.
Process of Manufactures of Concrete: Batching, Mixing, Transporting, Placing, Compaction, Curing, Need and Types of Curing, Accelerated Curing.
Assessment of Fresh Properties of Concrete: Workability of Concrete, Factors Affecting Workability, Measurement of Workability – Slump Test, Flow Test, Compaction Factor Test and Vee-Bee Consistometer Tests, Segregation and Bleeding.
Text Book 3: Ch 12, Ch 6 – 7.
Text Book 4: Ch 14, Ch 4 – 5.

Module-5	**08 Hrs**

Properties of Hardened Concrete: Mechanical Properties of Concrete-Compressive Strength, Split Tensile Strength, Flexural Strength, Modulus of Elasticity and Bond Strength Tests, Tests on NDT.
Durability: Definition, Significance, Short Term and Long-Term Durability. Sulphate Attack, Chloride Attack, Carbonation of Concrete, Freezing and Thawing, Alkali Aggregate Reaction, Alkali Silica Reaction, Effect of Corrosion of Steel on Concrete.
Text Book 3: Ch 8 -11
Text Book 4: Ch 6 - 7, Ch 10 – 12.

PRACTICAL COMPONENT OF IPCC

Lab Experiments	**12 Lab Sessions**

1. Identification of Rocks and Minerals.
2. Testing of Cement: Consistency, Fineness, Setting Time, Specific Gravity, Soundness and Strength of Cement.
3. Testing of Fine Aggregate: Specific Gravity, Sieve Analysis and Zoning, Bulking of Fine Aggregate, Bulk Density, Silt Content.
4. Testing of Coarse Aggregate: Specific Gravity, Sieve Analysis, Bulk Density, Flakiness Index, Elongation Index, Water Absorption and Moisture Content, Soundness of Aggregate.

5. Concrete Mix Design by IS Code Method as Per 10262- 2019 and 456-2000, DOE Method. 6. Tests on Fresh and Hardened Concrete.

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify various building materials like stones, bricks, timber, and blocks, and explain their properties, types, and uses.
CO2	Interpret codal provisions for plastering, flooring, and roofing materials and systems.
CO3	Analyze codal requirements of aggregate properties, grading, and suitability for different concrete applications with admixtures.
CO4	Assess different mix design variables and calculate mix proportions using is code.
CO5	Analyze the mechanical properties and durability aspects of hardened concrete for long-term structural performance.

Text Books	
1	"A Textbook Building Materials" – P.C. Varghese , Prentice-Hall of India Pvt. Ltd., 2nd Revised edition (2015), ISBN-13: 9788120350915.
2	"Engineering Materials" Rangawala P.C, Charotar Publishing House Pvt. Ltd. 43rd edition (2017), ISBN-13: 9789385039171.
3	"Concrete Technology: Theory and Practice" – M. S. Shetty, S Chand and Company Pvt LTD 2013, ISBN-13: 9788121900034
4	"Properties of Concrete" – *A. M.* Neville, TransAtlantic Publications, Inc., 5th edition (2012), ISBN-13: 9780273755807.

Reference Books	
1	"Engineering and General Geology" – Parbin Singh S.K.Kataria and sons publications - 2013, ISBN-13: 978-9350144060.
2	"Concrete Technology"- A.R. Santakumar, Oxford University Press, 2007, ISBN-13: 978-0195684719
3	"Engineering Materials"- Sushil Kumar, Standard Publication and Distributors, 2010, ISBN-13: 978-8180141044.
4	"Building Construction" P.C. Varghese, PHI Learning, 2nd edition (2017), ISBN-13: 978-8120350992.

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/105102088
2	http://www.digimat.in/nptel/courses/video/105102088/L01.html

CO – PO MAPPING

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

Semester: III						
Engineering Survey						
Course Code	**:**	BCV304		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3: 0: 0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	PCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basic Mathematics
Knowledge on Fundamental Concepts	Scale, Distance, Angles, Area and 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 Survey: Definition and Importance of Surveying for Civil Engineers. Classifications of Surveying: Control Survey, Topographical Surveying, Construction Survey, Cadastral Survey, Hydrographic Survey and Underground Survey. **Measurement of Distance:** Various Types of Chains and Tapes, Laser Distance meter, Distance Measuring Wheel, Electronic Distance Measurement. **Chain Surveying:** Instruments, Chaining on Level and Sloping Ground. **Compass Surveying:** Types of Compasses, Uses, Bearings (WCB and QB). **Plane Table Surveying:** Equipment's and Accessories, Terms, Setting up the Plane table. (Only demonstration/ setting up of above instruments, No numerical problems). **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). **Tacheometric 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**
Areas and Volumes: Methods of Determining Areas by Trapezoidal and Simpsons' Rule. Measurement of Volume by Prismoidal and Trapezoidal Formula. Earthwork Calculation in Embankments. **Curves**: Types of Curves - Application of Curves in Civil Engineering. Components of Simple and Compound curve, Setting out of Simple and Compound curve by Theodolite (Rankine's method). Components of Reverse Curve. Transition Curve, Combined Curve and Vertical Curves.	

Various Types of Vertical Curves and its Applications. (Numericals only on Simple and Compound Curves).

Total Station Surveying: Features, Accessories and Advantages of Total Station. Measurement of Horizontal Angle, Vertical Angle, Distance, Slope, Vertical distance, Multiple Angles with Total Station. Using Total Station for Area measurement and Volume Calculation.

Text Book 1: Ch.12:12.1 – 12.5, Ch.13:13.1 –13.5, 13.8.
Text Book 1: V2- Ch.1:1.1 – 1.4, 1.10, Ch.2:2.1-2.4, Ch.3:3.1, Ch.4:4.1-4.2
Text Book 2: Ch.10: 10.1 – 10.3

Module – 4	**08 Hrs**

Coordinate Survey with Total Station: Measurement of Coordinates using Total Station, Creating Job files, Importance of Back Sight Data, Coordinate Data Recording. Data Transferring, Data Refinement.

Longitudinal and Cross Sectioning: Definition, Importance of L/S and C/S. L/S and C/S using Level, Theodolite and Total station.

Contours: Definition terms used Characteristics of Contours and Applications of Contours in Civil Engineering Practice. Contouring using Level, Theodolite and Total Station.

Construction Surveying: Setting out Works using Total Station.

Text Book 2: Ch.10: 10.6,
Text Book 1: Ch.9: 9.14 – 9.15, Ch.0:10.1 – 10.5, Ch.20: 20.7.

Module – 5	**08 Hrs**

GPS Surveying: Introduction. Overview of GPS system- Space, Control and User Segments. Reference Co-Ordinate Systems. Absolute and Differential Positioning with GPS.Gagan System in India. Types of GPS Receivers. Engineering Survey using Differential GPS.

Surveying with Drone: Introduction, Applications and Advantages. Features of Photogrammetric Mapping Method. Drone Surveying Requirements- Drone platform, Flight Planning Software, Sensor DGPS Equipment and Image Processing Software. Types of Drones and Sensors. Process of Drone Surveying – Flight Planning, DGPS Markers, Capturing Images, Post Processing of Images using Photogrammetry Software and Output Maps.

Remote Sensing and GIS: Application and uses in Engineering Surveying.

Text Book 2 : V2 – Ch.6: 6.1 – 6.3, Ch.8:8.15-8.17, Ch.9:9.3 – 9.14

Course Outcomes: After completing the course, the students will be able to	
CO1	Summarize various types of surveying and carry out distance measurement using various equipment's.
CO2	Demonstrate the setup and use of survey instruments to measure the distance, angles and elevations in surveying.
CO3	Apply various methods to calculate the area, volume and curves and evaluate how total stations to enhance accuracy in surveying.
CO4	Make use of total station and survey instruments to conduct coordinate, longitudinal sections, cross sections and contour survey for construction projects.
CO5	Asses the use of GPS, DGPS, Remote Sensing, GIS and Drone surveying for solving engineering problems.

Text Books	
1	"Surveying" Volume 1 and 2, Dr. B C Punmia, Ashok Kumar Jain and Arun Kumar Jain, 17th Edition, 2022, Laxmi Publications. ISBN-978-81-7008-853-0
2	"Surveying" Volume – 1 and 2, S K Duggal, 5th Edition, 2019, McGraw Hill Education. ISBN-13: 978-9353167509

Reference Books	
1	"Surveying" Volume – 1 and 2, Dr. K R Arora, 17th Edition, 2019, Standard Book House. ISBN-13: 9788189401238
2	"Surveying and Levelling" N N Basak, 2nd Edition, 2017, McGraw Hill Education, ISBN-978-9332901537
3	"Advanced Surveying" Gopi Satheesh, R Sathikumar, N Madhu, 2nd Edition, 2017, Pearson Education, ISBN-13: 978-9352860722
4	"Remote Sensing and GIS" by B Bhatia, Oxford University Press, New Delhi. ISBN-10: 0199496641
5	"Surveying Theory and Practice", SS Bhavikatti, Dreamtech Press, 2nd Edition, 2019, ISBN-13: 978-9389447071
6	"Elementary Surveying: An Introduction to Geomatics", Charles D. Ghilani, 13th Edition, 2012, Prentice Hall, ISBN-13: 978-0-13-255434-3

Web links and Video Lectures (e – Resources)

- https://www.civil.iitb.ac.in/~dhingra/ce152_files/ce152_MNK.pdf
- E Book Surveying with a Drone, wingtra.com
- Drones:https://equinoxsdrones.com/10-major-pros-cons-of-unmanned-aerial-vehicleuav-drones/
- https://aabsys.com/an-introduction-to-remote-sensing-and-gis/
- https://www.youtube.com/watch?v=-4D1-eSEWXw

CO – PO MAPPING

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

Semester: III						
Surveying Practice						
Course Code	**:**	BCVL305		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	0:0:2		**CIE**	**:**	50Marks
Total Hours	**:**	12 P		**SEE**	**:**	50Marks
Course Type	**:**	PCCL		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Engineering Survey
Knowledge on Fundamental Concepts	Basics of Mathematics, Knowledge of surveying instruments.
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Apply the basic principles of engineering surveying and measurements.
CLO2	Demonstrate conventional surveying instruments necessary for engineering practice.
CLO3	Make use of total station in the survey of various construction projects.
CLO4	Choose modern surveying instruments based on applications.
CLO5	Execute effective field surveying procedures.

	List of Experiments **12 Lab Sessions**
1.	The exhibit on chain, compass and plane table surveying accessories. To measure distance between two points using direct ranging.
2.	Measurement of distance between two points using direct ranging.
3.	Determination of reduced levels of points using dumpy level/ auto level (differential levelling and inverted levelling).
4.	Measurement of horizontal and vertical angles by Theodolite.
5.	Setting out simple and compound curve by Rankine's method using Theodolite.
6.	Determination of the tachometric constant with line of sight horizontal and inclined.
7.	Setting up of Total station. Features and components of Total station.
8.	Measurement of Distance, vertical distance, horizontal and vertical angles using Total station.
9.	Longitudinal sectioning and cross sectioning using Total station.
10.	Contouring plotting with Total station.
11.	Setting out central line of a residential building.
12.	Understanding GPS component and simple map, Basics of UAVs-Drones, sensors, LiDAR.

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify various types of conventional surveying accessories and measure the distance between two points.
CO2	Illustrate the applications of dumpy level/auto level and theodolite.
CO3	Set out simple and compound curves for civil engineering applications and

	determine tacheometric constants.
CO4	Utilize Total station in various construction projects.
CO5	Demonstrate the use of GPS and Drone Surveying.

Text Books	
1	"Surveying (Volume 1 and 2)", Dr. B C Punmia, Ashok K. Jain, Arun K. Jain 17th edition, Laxmi Publications (P) LTD, 2016. ISBN:81-7008-054-1.
2	"Surveying (Volume 1)", Dr. K.R. Arora – 17th edition, Standard Book House since 1960 unit of Rajsons Publications Pvt Ltd, 2019. ISBN : 978-81-89401-23-8.

Reference Books	
1	"Elementary surveying: an introduction to geomatics", Charles D. Ghilani, Paul R Wolf, 13th edition, Publisher Pearson, 2018. ISBN: 9789353061739.
2	"Concepts and techniques of Geographic Information systems", C.P. Lo, Albert K.W. Yeung, 2nd edition, Person Prentice hall publication, ISBN:0-13-149502.

Web links and Video Lectures (e – Resources)	
1	https://enterprise.dji.com/surveying/land-surveying
2	https://www.gps.gov/applications/survey/
3	https://www.constructionplacements.com/total-station-in-surveying-types-uses-and-applications/
4	https://www.youtube.com/watch?v=bbs5AEPstl4
5	https://www.youtube.com/watch?v=KHI4TEeexuM&list=PLLy_2iUCG87DwNVc3Mz1yYlRA42jSQ1t
6	https://www.youtube.com/watch?v=Iu9vrE48_I4&list=PLLy_2iUCG87DwNVc3Mz1yYlRA42jSQ1tB
7	https://www.youtube.com/watch?v=RXUi2cX4CkU
8	https://www.youtube.com/watch?v=SVa66vO08So

CO – PO MAPPING

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

Semester: III						
Smart Urban Infrastructure						
Course Code	**:**	BCV306A		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	ESC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Elements of Civil Engineering
Knowledge on Fundamental Concepts	Construction and Civil Engineering Principles, Sustainability Concepts.
Knowledge on Connected Tools (If any)	--

Course Learning Objectives: This course will enable the students to	
CLO1	Apply the urban infrastructure systems and their management
CLO2	Illustrate smart cities key concepts
CLO3	Understand the transport and energy smart urban infrastructure and services
CLO4	Develop feasibility studies for smart city services
CLO5	Understand the global context of smart cities

Module – 1	**08 Hrs**
Introduction to Smart Urban Infrastructures and Smart Cities: Introduction to Smart City, Basic Concept of Developing Smart City, Global Standards to Create Smart City. Different Conceptual Approaches to Smart Cities and Discussing the Pros and Cons of Each Approach. Smart Urban Infrastructure: List of Infrastructure Facilities, Advantages and Disadvantages. **Text Book 1:** Ch.1:1.1-1.4,1.10-1.11. **Text Book 2:** Ch.1:1.1-1.5.	
Module – 2	**08 Hrs**
Smart energy Systems: Introduction to Smart Energy Systems, Government Policy and Technology. Energy Sector to Explore Some of the Most Important Managerial Considerations in the Transition Phase and Operation of Smart Urban Energy Systems. Design on Bioclimatic and Solar Passive Architecture, Considerations of Energy Consumption. **Text Book 2:**Ch.4:4.1-4.5.	
Module – 3	**08 Hrs**
Smart Transportation Technologies: Introduction to Smart Transportation System, Mode of Transport Systems for Smart City, Data Collection to Arrive at Best Transport Facility. Significant Opportunities and Threads for Legacy Urban Transportation Systems. Managerial Considerations to Facilitate the Transition Phase and Operation of Smart Urban Transportation Systems. **Text Book1:** Ch.3:3.1-3.4.	
Module – 4	**08 Hrs**
Towards Smart Cities: Important Factors in the Transition Phase of Legacy Cities to Smart Cities and their Managerial Implications. Design Thinking Applied **Text Book 1:** Ch.5:5.1-5.5.	
Module – 5	**08 Hrs**
Management of Smart Cities: calls for different approaches from conventional urban management approaches. The role of city government, Design Principles and Policy Approaches, Standardization and Regulation.	

Text Book 1: Ch5:5.1-5.5.

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the concept of smart city
CO2	Apply the role of a civil engineer in providing smart infrastructure
CO3	Design efficient energy system for smart city
CO4	Develop managerial implification towards smart city services
CO5	Analyse the efficient transport system

Text Books	
1	Building Smart Cities, Carol L. Stimmel , CRC Press Taylor and Francis Group, 2022.ISBN-13 978-1032340128,
2	Solving Urban Infrastructure Problems Using Smart City Technologies: Handbook on Planning, Design, Development, and Regulation, John R. Vacca,Publisher-Elsevier Science, 18thSeptember 2020. ISBN: 978-0128168165

Reference Books	
1	Urban Planning and cultural identity, William J. V. Neill; Routledge, London, 2004. ISBN: 0415197473
2	Smart Cities: Foundations, Principles, and Applications, Houbing Song, Ravi Srinivasan, Tamim Sookoor, Sabina Jeschke . Wiley, , 2017. ISBN: 978119226390.
3	Smart Cities for Sustainable Development, Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep Chachra, P.S. Janaki Krishna, Springer,2022. ISBN-13 978-9811674099.

Web links and Video Lectures (e – Resources)	
1	https://www.coursera.org/learn/smart-cities
2	https://www.youtube.com/watch?v=PTn4gL-ULXg
3	http://kcl.digimat.in/nptel/courses/video/124107007/L43.html
4	http://kcl.digimat.in/nptel/courses/video/124107007/L30.html

CO – PO MAPPING

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

Semester: III						
Sustainability in Construction						
Course Code	:	BCV306B		**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0		**CIE**	:	50 Marks
Total Hours	:	40 L		**SEE**	:	50 Marks
Course Type	:	ESC		**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Elements of Civil Engineering
Knowledge on Fundamental Concepts	Construction Technology, Conservation of Natural Resources
Knowledge on Connected Tools (If any)	--

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the basics of why sustainable construction practices are important for the present and future economies
CLO2	Acquire knowledge of and critically assess the various forms of energy utilization in buildings
CLO3	Acquire knowledge and apply life cycle assessment (LCA) methods in building construction projects
CLO4	Understand and apply various green rating standards in building construction
CLO5	Familiarize learners with the social dimensions of sustainability in the construction industry

Module – 1	**08 Hrs**
Introduction to Sustainability: Meaning of Sustainability, Components of Sustainability, Sustainable Practices in Construction, Carbon Cycle – Role of Construction Material: Concrete and Steel, Etc. – CO_2 Contribution from Cement and Other Construction Materials. Environment, Economy and Social Aspects, Building Life Cycle, Resource use in the Built Environment. **Text Book 2:** Ch.1 - 2	
Module – 2	**08 Hrs**
Life Cycle Energy: Introduction to Life Cycle Energy, Various Types of Energy in Buildings, Embodied Energy, Onsite Construction Energy, Operational Energy and Demolition Energy, Methods to Reduce Life Cycle Energy Use. **Text Book 2:** Ch.3 - 5, **Text Book 3:** Ch.3	
Module – 3	**08 Hrs**
Life Cycle Assessment: Introduction to Life Cycle Assessment in Building, Types of Life Cycle Assessment, Buildings and Green Project Management, Green Product Certifications, Features of Sustainable Building Materials and Sustainable Alternatives for Structural, Envelope and Finishing Materials. Low Carbon Cement, Carbon Footprint, Zero Emission Bricks and Lean Construction Practices. Life Cycle Assessment and its Types – Modelling and Analysis, Greenhouse Gas Emission. Different Phases of Green Building Project Management. **Text Book 3:** Ch.3 , Ch. 6	
Module – 4	**08 Hrs**
Green Building Ratings: Overview and Use of LEED, GRIHA, BREEAM, Green Globes, CASBEE, ICC-ES, IGBC criteria for certification -site selection credits, pre-design credits, detailed design credits, pre-construction credits, construction credits, post construction	

credits. **Text Book 1:** Ch.2 – 5	
Module – 5	**08 Hrs**
Social Aspects of Sustainability: Role of civil engineers in promoting equitable and inclusive development, Occupational Health and Safety of Construction Workers, Introduction to Sustainable Civil Infrastructure Development and alternative construction practices. **Text Book 3:** Ch.15 - 16	

Course Outcomes: After completing the course, the students will be able to	
CO1	Recognize the significance of sustainable construction practices in relation to current and future economic contexts
CO2	Demonstrate the different forms of energy consumption in buildings.
CO3	Implement green project management approaches and assess the building life cycle
CO4	Evaluate the application of different green rating standards in building construction.
CO5	Analyze the social sustainability factors within the construction industry

Text Books	
1	"The Engineering Guide to LEED-New Directions (Green Source): Sustainable construction", Liv Haselbach, McGraw-Hill Professional, 2008, ISBN: 978-0071489935.
2	"Green Building: Project Planning and Cost Estimating", Macaluso, J. Second Edition, RS Means, Reed Construction Data, Inc., 2006. ISBN: 978-0876298268.
3	"Environmental life cycle assessment of goods and services: an input-output approach". Hendrickson, C. T., Lave, L. B., and Matthews, H. S. Routledge.2010. ISBN: 9781-9363-31383.

Reference Books	
1	"Green Building Fundamentals", HarharaIyer G, Notion Press – 2022. ISBN: 979-8-88641-643-5.
2	"National Building Code – 2016", Volume 1 and 2, Bureau of Indian Standards, NewDelhi.

Web links and Video Lectures (e – Resources)	
1	https://lntedutech.com/micro-learning/
2	https://www.bing.com/videos/riverview/relatedvideo?q=sustainable%20construction%20techniques%20iit%20syllabus&view=riverview&mid=DBD35AE62E42DF67FAB4DBD35AE62E42DF67FAB4&ajaxhist=0
3	IGBC Green New Buildings v3.0 - Third Addendum_April 2015.pdf

CO – PO MAPPING

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

Semester: III						
Rural, Urban Planning and NBC						
Course Code	**:**	BCV306C		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	ESC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basics of Town and Country Planning, Civil Engineering Drawing, Environmental Studies.
Knowledge on Fundamental Concepts	Fundamentals of Urban and Rural Infrastructure Development, Principles of Land use Planning, Building Codes and Standard.
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the types of urban infrastructure systems and the data requirements.
CLO2	Identify the components of urban services and explain their functional interrelationships.
CLO3	Apply the concept of water rights related to both excess use and underutilization of water resources.
CLO4	Analyze the influence of population density and urban land use on sanitation and solid waste management infrastructure.
CLO5	Apply appropriate planning principles to develop infrastructure solutions.

Module – 1	**08 Hrs**
Definitions and Rationales of Planning: Definition of Urban and Rural; Basic Definitions and Frequently Used Terminology in Planning – Land Use, Demography, Physical Infrastructure, Social Infrastructure and Housing; Basic Concepts: Urban Sprawl, Sub Urban and Peri-Urban Areas, Central Business District (CBD), Urbanization, Rural-Urban Continuum, Conurbation, Satellite Town/Counter Magnets. Goals, Objectives and Components of Planning; Benefits of Planning; Planning as a Discipline and Multidisciplinary Nature of Planning; Different Roles of Planners, Data Required for Provision and Planning of Urban Infrastructure. **Text Book 1:** Ch.1.	
Module – 2	**08 Hrs**
Networks and Services Systems: Foundations of Planning and Levels of Planning: Components of Sustainable Urban and Regional Development; Reasoning and its Forms In Planning; Planning Knowledge and Its Various Forms; Arguments for And Against Planning; Economic and Social Aspects as Bases of Town and Country Planning, Constitution of India; Nature of the Indian Federal Structure; Hierarchy of Administrative Boundaries in India; Various Levels of Planning; Reasoning and its Various in Planning - Space, Place and Location, Cost Recovery, Gap Analysis. **Text Book 1:** Ch. 4.	
Module – 3	**08 Hrs**
Development Plans: Need for Hierarchy of plans – Types and Scope of various scales of plans – Perspective Plan, Regional Plan – Block Development Plan - Structural Plan, Master Plan, Detailed Development Plan/Zonal Plan/Town Planning Schemes - Local Area	

Plan - Layouts – Significance of plans – Case studies. **Text Book 2:** Ch.14.	
Module – 4	**08 Hrs**
Approaches to Planning and Planning Organizations: Classical Approaches to Planning; Comparative Understanding of the Process, Objectives and Strategies. Sustainability and Rationality in Planning; Local Government of India; District Planning Committees and Metropolitan Planning Committees; Different Development Authorities and Other Organizations. **Text Book 2:** Ch.15.	
Module – 5	**08 Hrs**
Planning Process: Planning System in India - Institutional Mechanism, Plan Making Process – Delineation of Planning Area, Formulation of Aim and Objectives, Art of Visioning; Plan Period, Assessment of Developmental Issues, Projection of Requirements, Development Proposals and Phasing - Public Participation - Constraints in Plan Preparation and Implementation – Case Studies. **Text Book 1:** Ch. 5.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the influence of planning as a profession and its correlation with other disciplines.
CO2	Identify the foundational concepts and terminologies used in planning.
CO3	Apply the knowledge on various approaches and planning organizations.
CO4	Analyze spatial and socio-economic data for assessment of developmental issues and future needs.
CO5	Analyze real-life case studies to see how planning works in practice.

Text Books	
1	"Town Planning," Jain, A.K., 2020, Khanna Book Publishing Co., New Delhi, 2020, ISBN No:978-9386173409.
2	"Dictionary of Urban and Regional Planning", 2006, S.K.Kulshrestha, Kalpaz Publications, 2006, ISBN No:8178354721.

Reference Books	
1	"Introduction to Urban Planning", Anthony James Catanese, and James C.Synder, McGraw-Hill, Inc, US,1988,**I**SBN No: 978-0070102293.
2	"Urban Planning by Objectives", Patel, S.B, *Economic and Political Weekly* (a publication of the Sameeksha Trust, Mumbai), 1997, ISBN No: 0012-9976.
3	"Reforms in Urban Planning Capacity in India Final Report", Niti Aayog," September 2021. ISBN: 978-81-321-0077-5(HB)
4	"Regional Planning in India",Chand.M, Puri.V.K, Allied Publishers, New Delhi,1983 ISBN No: 9788170230588.
5	"Arguments for and Against Planning", Klosterman, R.E, Liverpool University Press, New Delhi. 1985.ISBN:9780262305723.
6	"Urban Planning in India", Amiya Kumar Das, 2007, Rawat Publications, Jaipur / New Delhi, ISBN**:** 978-8131600948.

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/channel/UC6GZxJAucQK7HBFynRG1Msw/videos

2	https://www.youtube.com/c/CentreforLiveableCities
3	https://www.digimat.in/nptel/courses/video/124107158/L23.html

CO – PO MAPPING

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

Semester: III						
Fire Safety in Buildings						
Course Code	**:**	BCV306D		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	ESC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Knowledge of structural components and systems, Understanding of material properties under fire conditions
Knowledge on Fundamental Concepts	Heat transfer, Combustion process, Building Planning and Design Principles, Basic Fluid Mechanics (for fire suppression system)
Knowledge on Connected Tools (If any)	AutoCAD

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the process of combustion and the fire resistance of building materials
CLO2	Be aware of fire safety zones, escape routes, and protection systems in buildings.
CLO3	Have knowledge of firefighting water systems, suppression methods, and HVAC connections.
CLO4	Recognize electrical fire hazards, wiring types, and fire safety checks.
CLO5	Review fire damage in structures, testing methods, and fire safety improvements.

Module – 1	**08 Hrs**
Fire Safety: Introduction, Importance of fire safety in buildings, Asphyxiation, Fire hazards and Risks in buildings, Basic concepts of Fire Protection, Fire as a process of Combustion, Types of Fires and Fire Spread mechanisms, Ventilation and Fuel controlled fire behavior, Effect of fire on construction material, Planning for Fire Protection, Fire Resistance, Fire-Resistant Design of Steel and Concrete Structures, National Building Code (NBC) Fire Safety Provisions. **Text Book 1:** Ch.1: 1.1 – 1.3, Ch.2: 2.1 – 2.10, Ch.3: 3.1 – 3.5, Ch.4: 4.1 – 4.4, Ch.7: 7.1 – 7.5. **Text Book 2:** Part 4, Ch.1; Sections 3-6.	
Module – 2	**08 Hrs**
Fire Escape Design: Introduction to Fire Safety in Urban Planning, Fire Detection, Internal Planning for fire safety, Fire escape and Refuge areas, NBC guidelines for Egress design, Fire suppression systems, Smoke detection system, Sprinklers, Types. **Introduction to Lift Design:** Design of lift system, Safety consideration in Lift design (NBC guidelines), Escalator and Vertical transport system, Maintenance and fire safety provisions for escalators, Case studies of lift and escalator safety incidents. **Text Book 1:** Ch.4, Ch.5, Ch.6: 6.1 – 6.5. **Text Book 2:** Part 4, Sections 6, Ch.7:7.2, 7.3, Ch.8:8.3-8.6, Ch.9:9.5. **Text Book 3:** Ch.9, Ch.10, Ch.12, Ch.13.	
Module – 3	**08 Hrs**
Water supply for firefighting: Fire demand and water supply requirements, Empirical formulas for fire demand calculations, Emergency water supply integration with domestic supply. **Fire hydrant networks:** Layout strategies for Horizontal and Vertical developments, Components – Yard hydrants, Landing valves, Rubber hose heels, Quick brass couplers,	

etc., Fire risks in HVAC systems, Smoke ventilation and pressurization systems, Fire dampers and Ducting Fireproofing. **Text Book 2:** Part 4, Sections 7.4, 7.5. **Text Book 3:** Ch.14, Ch.15. **Text Book 3:** Ch.10-11.

Module – 4	**08 Hrs**
Electrical hazards in buildings: Introduction to electrical fire hazards in buildings, Common causes – short circuits, overloading, poor wiring, Fire resistant electrical components, Intelligent fire alarm and detection system, Components of fire alarm system – smoke, heat and gas detectors, Preventive maintenance of electrical and mechanical system, Fire safety inspection and audits, Life cycle cost analysis of fire safety measures. **Text Book 1:** Ch. 5. **Text Book 2:** Part 4, Sections 7.2, 7.7,10 **Text Book 3:** Ch.11-12.	
Module – 5	**08 Hrs**
Fire damage assessment: Importance of fire damage assessment, Virtual inspection and structural integrity analysis, Non Destructive Testing for fire affected structures, Sustainable fire safety solutions and retrofitting. **Fire retrofitting and rehabilitation:** Fire resistant coatings and structural strengthening, Passive fire protection and retrofitting techniques. **Fire safety audits (As per Codal provisions/NOC**): Introduction to fire safety audits, Objectives and scope, Legal requirements, Fire hazard identification and risk rating, Audit documentation and reporting standards, Recommendations for fire protection and remediation measures. **Text Book 1:** Ch.4: 4.3, Ch.7: 7.5 **Text Book 2:** Part 4, Sections 10-11 **Text Book 4:** Ch.12-13	

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain the process of combustion and the fire resistance of building materials.
CO2	Interpret fire safety zones, escape routes, and protection systems in buildings.
CO3	Apply knowledge of firefighting water systems, suppression methods, and HVAC connections.
CO4	Analyze electrical fire hazards, wiring types, and fire safety inspection procedures.
CO5	Evaluate fire damage in structures, testing methods, and fire safety improvements.

Text Books	
1	"Fire Safety Engineering Design of Structures", John A. Purkiss and Long-Yuan Li, 3rd Edition, 2013, CRC Press, ISBN-10: 1466585471, ISBN-13: 978-1466585478.
2	"National Building Code (NBC) of India – Part 4: Fire and Life Safety", Bureau of Indian Standards (BIS).2016 ISBN: 978-9381315747
3	"SFPE Handbook of Fire Protection Engineering", 5th Edition, Springer,2016.ISBN: 978-1493929117
4	"Handbook of Fire and Explosion Protection Engineering Principles", Dennis P. Nolan, 1st Edition, Gulf Professional Publishing,2007. ISBN: 978-0123739739

Reference Books	
1	"An Introduction to Fire Dynamics", Dougal Drysdale, 3rd Edition, Wiley India,2011. ISBN-10: 0470319038, ISBN-13: 978-0470319031.
2	"Fire Protection Systems", A. Maurice Jones Jr., 2nd Edition, Jones and Bartlett Learning,2014.ISBN-10: 0763774743, ISBN-13: 978-0763774740

3	"HVAC Design for Cleanroom and Other Controlled Environments", William J. Whyte, 1st Edition, Wiley India,2010. ISBN-10: 0471724555, ISBN-13: 978-0471724551.
4	"Structural Fire Engineering", Venkatesh Kodur and M. N. Bisby, 1st Edition, McGraw-Hill Education,2010. ISBN-10: 0071453699, ISBN-13: 978-0071453694.
5	"IS 1646 - 2015: Code of Practice for Fire Safety of Buildings – General Principles of Fire Grading and Classification", Bureau of Indian Standards.2015.
6	"IS 2189-2008: Selection, Installation, and Maintenance of Automatic Fire Detection and Alarm System", Bureau of Indian Standards.2008
7	"IS 3809-1979: Fire Resistance of Structural Elements", Bureau of Indian Standards.1979.

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=gO7jja2eUHA
2	https://www.youtube.com/watch?v=_8P9ndGVnwM
3	https://www.youtube.com/watch?v=SEnpyqn_jS4
4	https://www.youtube.com/watch?v=oAADe-2IrrQ
5	https://www.youtube.com/watch?v=A5dOc76dqdI
6	https://www.youtube.com/watch?v=KbZF6ARWXLs
7	https://www.youtube.com/watch?v=V7OtDePgpyY
8	https://www.youtube.com/watch?v=bHshVl8Ctew
9	https://www.youtube.com/watch?v=RMDDOI5c_fE
10	https://www.youtube.com/watch?v=tyr8O_bTRPE

CO – PO MAPPING

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

Semester: III					
Social Connect and Responsibility					
Course Code	**:**	BSC307	**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	0:0:2	**CIE**	**:**	100 Marks
Total Hours	**:**	15 P	**SEE**	**:**	-
Course Type	**:**	UHV	**SEE Duration**	**:**	-

Course Objectives: This course will enable the students to	
CLO1	Understand and appreciate the importance of environmental sustainability, cultural heritage and traditional practices.
CLO2	Apply experiential learning through field visits, case studies and community interaction.
CLO3	Develop skills in documentation, reporting and creative presentation through photo blogs or documentaries.
CLO4	Demonstrate awareness of organic farming, waste management, water conservation and their implementation in campus or community settings.
CLO5	Recognize the significance of indigenous crafts, culinary traditions and their socio-cultural value.

Module 1	**03 Hrs**
Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - – Objectives, Visit, case study, report, outcomes. **Text Book 1**	
Module 2	**03 Hrs**
Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - – Objectives, Visit, case study, report, outcomes. **Text Book 2**	
Module 3	**03 Hrs**
Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus – Objectives, Visit, case study, report, outcomes. **Text Book 3**	
Module 4	**03 Hrs**
Water conservation: Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes. **Text Book 4**	
Module 5	**03 Hrs**
Food walk: City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study, report, outcomes. **Text Book 5**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Elucidate the significance of tree plantation, cultural heritage, organic farming, waste management, water conservation and traditional food practices
CO2	Demonstrate the ability to plan and execute community-focused environmental and cultural activities
CO3	Prepare and present photo blogs or documentaries to document and communicate findings.
CO4	Apply sustainable practices learned from field visits in campus or community projects.
CO5	Appreciate and promote indigenous knowledge, crafts and culinary traditions as part of cultural preservation.

Text Books	
1	"Environmental Studies" Erach Bharucha, University Grants Commission, New Delhi.ISBN: 9788173718625
2	"Cultural Heritage of India" Haridas Bhattacharyya, Volumes 1–6, The Ramakrishna Mission Institute of Culture.
3	"Organic Farming: Principles and Practices" P. Bhattacharyya and D.Chakraborty, Scientific Publishers.ISBN: 978-81-7910-348-7
4	"Water Resource Engineering"Larry Mays, Wiley. ISBN:9788126531646
5	"Indian Food: A Historical Companion" K. T. Achaya, Oxford University Press.

CO – PO MAPPING

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

Semester: III						
MS Office and Latex						
Course Code	**:**	BCV308A		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	0:0:2		**CIE**	**:**	50 Marks
Total Hours	**:**	12 P		**SEE**	**:**	50 Marks
Course Type	**:**	SEC		**SEE Duration**	**:**	2 Hours

Prerequisites:	
Courses	C and Python programming, CAED
Knowledge on Fundamental Concepts	OS basics, Keyboard and mouse proficiency, text-editing essentials, elementary math operators and cell references,
Knowledge on Connected Tools (If any)	Code editors, compilers, creation, formatting and presentation of technical content

Course Learning Objectives: This course will enable the students to	
CLO1	Create technical documents using MS Word with proper formatting and structure.
CLO2	Apply MS Excel functions for engineering calculations and data visualization.
CLO3	Design professional presentations in MS PowerPoint with multimedia elements.
CLO4	Utilize the knowledge to prepare well-structured documents in LaTeX with text, figures, and references.
CLO5	Format mathematical equations and tables in LaTeX for academic reports.

List of Experiments **12 Lab Sessions**
1.Creating and Formatting a Technical Report in MS Word: Introduction to MS Word Features (Styles, Headers/Footers, Table of Contents), Hands-On: Create Title Page, Insert Headers/Footers, Format Headings, Add TOC, Insert And Format Images/Tables, Save and Submit.
2.Using MS Excel For Engineering Calculations: Overview of Excel Formulas, Functions and References, Hands-On: Build Spreadsheet for Beam Property Calculations Using Formulas, Create Charts to Visualize Data, Review and Troubleshoot.
3.Creating And Customizing A Presentation in MS Powerpoint: Basics of Powerpoint, Slide Layout and Master Slide, Hands-On: Prepare 10 Slides With Text, Images and Charts, Add Animations, Transitions, Multimedia, Present Sample Slides.
4.Mail Merge In MS Word: Explanation Of Mail Merge Concept and Data Sources, Hands-On: Create Letter Template and Link to Excel Data, Complete Merge and Preview Personalized Letters, Save and Print/Export.
5.Advanced Table Formatting In MS Word: Table Creation, Merging Cells, Border/Shading Styles, Hands-On: Create Formatted Table With Formulas Inside Cells, Sort Table Data, Modify Formatting, Final Review and Save.
6.Data Analysis Using Excel Pivot Tables: Introduction To Pivot Tables and Charts, Hands-On: Create Pivot Tables and Charts From Dataset, Experiment With Different Pivot Table Layouts and Filters

7.Preparing a Resume/CV Using MS Word: Resume Format Overview and Design Tips, Hands-On: Create Resume With Columns, Bullets, Tables and Hyperlinks, Format Text and Export As PDF, Peer Review and Corrections
8.Introduction To Latex – Document Preparation: Latex Setup and Document Structure Explanation, Hands-On: Write Title, Author, Date, Sections, Subsections, Compile and View Output PDF, Troubleshooting
9.Typesetting Mathematical Equations In Latex: Math Mode Basics and Environments, Hands-On: Write Inline/Display Math, Matrices, Special Symbols, Numbering Equations and Referencing, Compile and Review Output
10.Creating Figures, Tables and References in Latex: Adding Figures, Tables, Captions, Hands-On: Insert Images, Create Tables with Captions, Cross-References, Add Bibliography with Bibtex, Compile Document and Final Review.

Course Outcomes: After completing the course, the students will be able to	
CO1	Create formatted technical reports using MS Word features.
CO2	Apply MS Excel tools for engineering calculations and charts.
CO3	Design effective presentations in MS PowerPoint with visuals.
CO4	Develop structured documents in LaTeX with images and references.
CO5	Organize mathematical content in LaTeX for professional reports.

Text Books	
1	"Microsoft Office 2019: In Practice", 1st Edition by Randy Nordell, Annette Marquis, Cengage Learning Publishers 2018, ISBN-13: 978-1337616354.
2	"LaTeX: A Document Preparation System", 2nd Edition by Leslie Lamport, Addison-Wesley Professional Publishers, ISBN-13: 978-0201529838.

Reference Books	
1	"Microsoft Office 365 and Office 2019: Introductory", Misty E. Vermaat, Jennifer T. Campbell, et al., 1st Edition Cengage Learning publishers 2019, ISBN-13: 978-1337408193.
2	"The LaTeX Companion", Frank Mittelbach, Michel Goossens, et al., 2nd Edition Addison-Wesley Professional publishers 2004, ISBN-13: 978-0201362992.

Web links and Video Lectures (e – Resources)	
1	https://www.microsoft.com/en-us/microsoft-365/microsoft-office
2	https://www.latex-project.org/

CO – PO MAPPING

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

Semester: III						
Introduction to AI and ML in Civil Engineering						
Course Code	**:**	BCV308B		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	1:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	15 L		**SEE**	**:**	50 Marks
Course Type	**:**	AEC		**SEE Duration**	**:**	1 Hours

Prerequisites:	
Courses	Basics of Mathematics and Programming.
Knowledge on Fundamental Concepts	Basic understanding of Artificial Intelligence and its applications, Basic understanding of key civil engineering areas such as structural design, materials, surveying, and construction relevant to AI applications.
Knowledge on Connected Tools (If any)	Python or MATLAB

Course Learning Objectives: This course will enable the students to	
CLO1	Use the basic concepts and branches of Artificial Intelligence (AI)
CLO2	Understand Machine Learning (ML) and how it applies to civil engineering projects.
CLO3	Learn the structure and working of Artificial Neural Networks (ANNs).
CLO4	Understand fuzzy logic and how it is used in civil engineering systems.
CLO5	Use computer vision techniques in civil engineering applications.

Module – 1	**03 Hrs**
Introduction to AI: Introduction to AI, definition of AI, Historical evolution of AI, AI types, brief introduction to the branches of AI, Machine learning, Natural Language processing, computer vision, robotics, expert systems, Artificial neural networks and deep learning, evolutionary computation, cognitive computing, and swarm intelligence. Applications in civil engineering in each branch of AI. **Text Book 1:** Ch.1: 1.1-1.3, Ch.2: 2.1-2.3, Ch.20: 20.1, Ch.21: 21.2, Ch.23: 23.1.	
Module – 2	**03 Hrs**
Machine Learning: Introduction to ML, Machine learning process model, Concept learning, general-to- specific ordering, version spaces, inductive bias, general to specific ordering, introduction to different kinds of machine learning, supervised, unsupervised, semi supervised, reinforcement, transfer learning and federated learning. The related algorithms under each type of ML, Applications of different ML techniques in Civil Engineering. Well posed learning problem, designing a learning system, examples. **Text Book 2:** Ch.1: 1.1-1.3, Ch.3: 3.1, Ch.4: 4.1, Ch.10: 10.1-10.2.	
Module – 3	**03 Hrs**
Artificial neural networks (ANN): Introduction, biological motivation, appropriate problems in ANN learning, perceptron's, the representational power of perceptions, multilayer networks, back propagation. Introduction to recurrent neural networks, and deep learning. Illustrative real-world examples on applications of neural networks in highway/ infrastructure construction management and other civil engineering domains. **Text Book 3:** Ch.6: 6.1-6.2, Ch.7: 7.1-7.2, Ch.10: 10.1-10.2.	
Module – 4	**03 Hrs**
Learning under uncertainty and ambiguity: Fuzzy logic, linguistic variables, fuzzy sets, membership functions, fuzzy set operations, fuzzy expert systems, fuzzification, defuzzification, fuzzy rules, fuzzy inferences. Fuzzy inference system, Illustrative examples of engineering applications of fuzzy logic with specific reference to civil engineering. **Text Book 4:** Ch.1: 1.1-1.2, Ch.2: 2.1-2.2, Ch.5: 5.1-5.2.	

Text Book 3: Ch.11- 12.	
Module – 5	**03 Hrs**
Introduction to Computer Vision: Definition and scope, history and evolution, Image acquisition, image representation (grey scale and colour), basic operations like filtering, thresholding. Primitives of image processing, geometric primitives, 2d Transforms, 3D transforms, photometric image formation, lighting, reflectance and shading, the digital camera, sampling and aliasing. Applications of computer vision in Civil engineering. **Introduction to Cyber Security:** Definition, Importance in modern infrastructure and smart cities, Types of Cyber threats, Securing smart infrastructure, Data privacy and civil engineering, Cyber security practices, Case studies: Cyber-attacks on smart grids or infrastructure projects. **Introduction to Data Warehousing:** Definition, Difference between data warehouse and regular database, Basic components, Role in Civil engineering, Applications in civil engineering, Data quality and management. **Text Book 5:** Ch.1:1.1-1.2, Ch.2:2.1-2.2, Ch.3:3.1, Ch.4: 4.1, Ch.23:23.1. **Text Book 6:** Ch.1:1.1-1.5. **Text Book 7:** Ch.1:1.1-1.5, Ch.13:13.1-13.2.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain the fundamental concepts and branches of Artificial Intelligence and their applications in civil engineering.
CO2	Describe different types of Machine Learning, their algorithms, and applications in civil engineering projects.
CO3	Illustrate the structure and working of Artificial Neural Networks and their use in civil engineering domains.
CO4	Explain fuzzy logic principles and apply fuzzy inference systems to engineering problems in civil engineering.
CO5	Demonstrate the basics of computer vision and its applications in civil engineering, including an understanding of cyber security and data warehousing concepts relevant to smart infrastructure.

Text Books	
1	"Artificial Intelligence: A Modern Approach", Stuart Russell and Peter Norvig, II Edition, 2003, Pearson Education, ISBN-13: 978-0137903955, ISBN-10: 0137903952
2	"Pattern Recognition and Machine Learning", Christopher M. Bishop, I Edition, 2006, Springer, ISBN-13: 978-0387310732, ISBN-10: 0387310738
3	"Deep Learning", Ian Goodfellow, Yoshua Bengio, Aaron Courville, I Edition, 2016, MIT Press, ISBN-13: 978-0262035613, ISBN-10: 0262035618
4	"Fuzzy Logic with Engineering Applications", Timothy J. Ross, IV Edition, 2016, Wiley Publishers, ISBN-13: 978-1119235866, ISBN-10: 1119235865
5	"Computer Vision: Algorithms and Applications", Richard Szeliski, I Edition, 2010, Springer, ISBN-13: 978-1848829343, ISBN-10: 1848829345
6	"Cybersecurity and Cyberwar: What Everyone Needs to Know", P.W. Singer and Allan Friedman, I Edition, 2014, Oxford University Press, ISBN-13: 978-0199918096 , ISBN-10: 0199918092
7	"Data Warehousing Fundamentals for IT Professionals", Paulraj Ponniah, I Edition, 2010, Wiley, ISBN-13: 978-0471200612, ISBN-10: 0471200617

Reference Books	
1	" Artificial Intelligence, Margaret A Boden, II Edition", 1996, Academic Press London, ISBN-13: 978-0121619640, ISBN-10: 0121619646

2	"Machine Learning", Tom.M.Mitchel, 2017, Indian Edition, Mc_Graw Hill, ISBN-13: 978-1259096952, ISBN-10: 1259096955
3	"Artificial Intelligence in Civil Engineering", Kothari Dwarkadas Pralhaddas, Samui Pijush, 2012, Lambert Academic Publishing, ISBN-13: 978-3659162276, ISBN-10: 3659162274
4	"Artificial Intelligence Applications in Material Science and Engineering", Paul D.Harrison, 2023, Kindle Edition, ISBN-13: 978-0323950595, ISBN-10: 0323950593

Web links and Video Lectures (e – Resources)	
1	https://www.researchgate.net/publication/383094533_Artificial_Intelligence_and_Applications_in_Civil_Engineering_Module_1
2	https://www.researchgate.net/publication/383669419_AI_and_Applications_in_Civil_Engineering_Module_2_Machine_Learning
3	https://www.researchgate.net/publication/383951466_AI_for_Civil_Engineers_Module_3_ANNs
4	https://www.researchgate.net/publication/384246445_AI_for_Civil_Engineers_Module_4_Dealing_with_Uncertainty
5	https://www.researchgate.net/publication/384429783_AI_and_Applications_in_Civil_Engineering_Module_5_Computer_Vision
6	http://digimat.in/nptel/courses/video/106106213/L01.html
7	http://digimat.in/nptel/courses/video/106106198/L01.html
8	https://www.youtube.com/watch?v=Op80iPN8mCM&t=516s
9	https://www.youtube.com/watch?v=C4so06zT85k
10	https://www.youtube.com/watch?v=esC381aaRM0

CO – PO MAPPING

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

Semester: III						
MATLAB for Civil Engineers						
Course Code	:	BCV308C		**Credits**	:	1
Hours/Week(L:T:P)	:	0:0:2		**CIE**	:	50Marks
Total Hours	:	12 P		**SEE**	:	50Marks
Course Type	:	SEC		**SEE Duration**	:	2 Hours

Prerequisites:	
Courses	Mathematics I for CV , Elements of Civil Engineering.
Knowledge on Fundamental Concepts	Basics of linear algebra and calculus, Computational /Numerical Techniques, Analysis of trusses using joint method.
Knowledge on Connected Tools (If any)	C and Python.

Course Learning Objectives: This course will enable the students to	
CLO1	Learn basics of MATLAB.
CLO2	Plot graphs, create functions.
CLO3	Understand scripts and functions.
CLO4	Formulate and solve the numerical problems on simply supported beams using MATLAB.
CLO5	Apply MATLAB programming skills to model and analyze trusses by joint method.

Experiments **12 Lab Sessions**
1. Basics of MATLAB, Input – Output, File types – Platform dependence – General commands.
2. MATLAB built-in functions.
3. Use an inline function for mathematical calculations in MATLAB.
4. Create, manipulate and perform basic operations on matrices and vectors in MATLAB.
5. Generate 2D plots for data visualization.
6. Create and execute MATLAB script files for automating repetitive tasks.
7. Explore MATLAB's programming features such as control flow, loops and conditional statements.
8. Calculate and plot SFD and BMD of simply supported beam subjected to point load at center.
9. Calculate and plot SFD and BMD of simply supported beam subjected to uniformly distributed load.
10. Calculate and plot SFD and BMD of simply supported beam subjected to uniformly varying load load.
11. Compute the inverse of a square matrix using MATLAB and verify the result.
12. Determine the forces in members of statically determinate truss using method of joints and MATLAB.

Course Outcomes: After Completing the Course, the Students will be able to	
CO1	Interpret the basics of MATLAB.

CO2	Plot simple graphs using functions in MATLAB.
CO3	Develop simple programs in MATLAB.
CO4	Apply the concept of MATLAB to solve simply supported beams.
CO5	Analyze the trusses using MATLAB.

Text Books	
1	"Getting Started with MATLAB-A Quick Introduction for Scientists and Engineers" RudraPratap, 2017, Oxford University Press, ISBN: 978-0-19-060206-2.
2	"Essential MATLAB for Engineers and Scientists"Brian H. Hahn, Daniel T. Valentine, 2017, 6th edition, Elsevier publication, ISBN: 978-0-08-100877-5.

Reference Books	
1	"Introduction to Matlab 7 for Engineers"- William John Palm III, McGraw-Hill Professional. New Delhi, ISBN-13:978-0-07-254818-5.
2	"Introduction to MATLAB 7"- Dolores M. Etter, David C. Kuncicky , Prentice Hall, New Delhi, ISBN 13:9780131474925.
3	"Matlab Programming"- Kirani Singh.Y, B B Chaudhuri , Prentice-Hall of India Pvt.Ltd, New Delhi, ISBN:978-81-203-3081-8.

Web links and Video Lectures (e – Resources)	
1	**https://www.youtube.com/watch?v=UNLU9e1qGBg&list=PLPLlcVV9fXj8-CqZAQSbAVwF9KJC1O7o_&index=2**
2	**https://www.mathworks.com/videos/modern-matlab-for-teaching-civil-engineering-5-things-you-need-to-know-1622049092112.html**

CO – PO MAPPING

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

Semester: III						
Automation and Robotics in Construction						
Course Code	**:**	BCV308D		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	1:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	15 L		**SEE**	**:**	50 Marks
Course Type	**:**	AEC		**SEE Duration**	**:**	1 Hour

Prerequisites:	
Courses	Construction Technology
Knowledge on Fundamental Concepts	Basics of construction methods including site operations, building processes, and modular construction concepts
Knowledge on Connected Tools (If any)	Basic skills in MS Excel for organizing data, performing simple calculations, and creating charts related to construction planning.

Course Learning Objectives: This course will enable the students to	
CLO1	Know the concepts related to the need, benefits, and challenges of automation in construction.
CLO2	List types of robotic technologies and their applications on construction sites.
CLO3	State the role of 3D printing and prefabrication in construction automation.
CLO4	Understand the role of BIM, IoT, and dashboards in project tracking.
CLO5	List the effects of automation on sustainability and necessary skills.

Module – 1	**03 Hrs**
Fundamentals of Construction Automation: Definition and evolution of automation in civil engineering, Need for automation: speed, safety, labor shortage, Benefits and challenges in adoption, Introduction to Construction 4.0 **Text Book 1:** Ch.1:1.1, Ch.2:2.1 - 2.2. **Text Book 3:** Ch.1, Ch.4:4.1 - 4.3.	
Module – 2	**03 Hrs**
Role of Robotics in Construction: Overview of construction robots: bricklaying, rebar tying, demolition, Drones and UAVs in site surveying and inspection, Safety and productivity improvements using robotics, Real-life project examples (e.g., Hadrian X, SAM). **Text Book 1:** Ch.3, Ch.4: 4.1-4.3. **Text Book 4:** Ch.2:2.1.	
Module – 3	**03 Hrs**
Prefabrication and 3D Printing in Construction: Concept of modular construction and its automation potential, 3D concrete printing: process, materials, limitations, Role of robotics in prefab and off-site construction systems. **Text Book 3:** Ch.7:7.1 – 7.2, Ch.5: 5.1. **Text Book 4:** Ch. 3 – 4.	
Module – 4	**03 Hrs**
Digital Tools – BIM, IoT, and Dashboards: Basics of Building Information Modeling (BIM), IoT-enabled smart monitoring: sensors, wearables, Cloud-based project tracking and site dashboards (e.g., Procore, ACC). **Text Book 2:** Ch.1, Ch.3, Ch.6. **Text Book 1:** Ch.5:5.1-5.3.	
Module – 5	**03 Hrs**

Future Scope, Skills and Sustainability: Environmental benefits of automated construction, Skills required: BIM tools, drone operation, data dashboards, India's readiness and case studies, Future trends: AI, Digital Twins, Swarm Robotics. **Text Book 1:** Ch.6:6.1, Ch.7. **Text Book 4:** Ch.5 – 6.

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the fundamental concepts, benefits, and challenges of automation in construction.
CO2	Identify robotic technologies and their uses on construction sites.
CO3	Apply 3D printing and prefabrication in construction automation.
CO4	Analyze the role of BIM, IoT, and dashboards in tracking construction projects.
CO5	Assess the effects of automation on sustainability and the skills required.

Text Books	
1	"Robot-Oriented Design", Thomas Bock, Thomas Linner, 1st Edition, Cambridge University Press, 2015, ISBN: 9781107076394.
2	"Building Information Modeling: BIM Handbook", Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, 3rd Edition, Wiley, 2018, ISBN: 9781119287537.
3	"Advanced Construction Technology", Roy Chudley, Roger Greeno, 5th Edition, Pearson Education Limited, 2012, ISBN: 9780273736135.
4	"Prefabrication with Robots in Construction", Thomas Bock, 1st Edition, Springer, 2015, ISBN: 9781107076394.

Reference Books	
1	"Construction 4.0 – An Innovation Platform for Built Environment", Anil Sawhney, Bilal Succar, Simon Rawlinson, I Edition, Routledge / CRC Press,2020, ISBN:9780367427121.

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=bHzrJPOljxQ
2	https://www.youtube.com/watch?v=-QMe_dGakm8
3	https://www.youtube.com/watch?v=l09Y0MZplSc

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								2
CO4	3	2	2		2						2
CO5	3	2	2								2

Semester: III						
Environmental Studies						
Course Code	**:**	BES309		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	1:0:0		**CIE**	**:**	50Marks
Total Hours	**:**	15 L		**SEE**	**:**	50Marks
Course Type	**:**	MC		**SEE Duration**	**:**	1 Hour

Prerequisites:	
Courses	Basic Science
Knowledge on Fundamental Concepts	Ecosystem, Natural Resources
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Create environmental and sustainability awareness among the students.
CLO2	Creating knowledge of relationship between the biotic and abiotic component
CLO3	Apply their ecological knowledge to illustrate and grasp the problem and describe the realities that managers face when dealing with complex issues.
CLO4	Develop skills, critical thinking and demonstrate socio-economic skills for Environmental protection
CLO5	Gain knowledge on different types of pollution in the environment, waste management and Environmental legislation

Module – 1	**03 Hrs**
Ecosystem and Sustainability: Ecology and Ecosystem: Structure of Ecosystem, components, Types: Forest, Desert, Wetlands, River, Oceanic ecosystems. **Sustainability:** 17SDG targets and possible actions. **Biodiversity:** Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation. **Text Book 1:** Ch., Ch.2-3	
Module – 2	**03 Hrs**
Natural Resource Management: **Advances in Energy Systems** (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. **Natural Resource Management** (Concept and case-studies): Disaster Management, Sustainable Mining - case studies and Carbon Trading **Text Book 2:** Ch.3-4	
Module – 3	**03 Hrs**
Environmental Pollution and Waste Management: **Environmental Pollution** (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. **Waste Management:** Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge. **Text Book 2:** Ch.5, Ch.16	

Module – 4	03 Hrs
Global Environmental Issues: Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology. **Text Book 3:** Ch.9-10	
Module – 5	**03 Hrs**
Environmental Legislation: Solid Waste Management Rules 2016, Biomedical Waste Management Rules, 2016. BBMP, BWSSB Norms **Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications):** GIS and Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs. **Text Book1:** Ch.10-12	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the principles of ecology and environmental issues that apply to air, land and water issues
CO2	Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components
CO3	Conduct survey to describe the realities of waste management system.
CO4	Identify the major challenges of environmental issues on a global scale
CO5	Apply their environmental legislation to illustrate problems and describe the realities that managers face when dealing with complex issues.

Text Books	
1	"Environmental Studies", Benny Joseph,Tata McGraw – Hill Publishing Company Limited.2005,ISBN-10: 9352605179.
2	"Environmental Studies", S.M. Prakash, Elite Publishers, Mangalore. 2007,ISBN: 9780857096364
3.	"Environmental Studies – From Crisis to Cure", R Rajagopalan, 2005, Oxford University Press.ISBN:978-0199459759

Reference Books	
1	"Environmental Studies",R.J.Ranjit Daniels and Jagadish Krishnaswamy, Wiley India Private Ltd., New Delhi,2009 ,ISBN 10: 8126519436
2	"Environmental Science – working with the Earth" ,G.Tyler Miller Jr., 10th Edition , Thomson Brooks /Cole,2004,ISBN-13: 9780534424084
3	"Elements of Environmental Science and Engineering",P. Meenakshi, Prentice Hall of India Private Limited, New Delhi,2006,ISBN: 8120327748

Web links and Video Lectures (e – Resources)	
1	https://sdgs.un.org/goals
2	https://archive.nptel.ac.in/courses/109/105/109105190/
3	https://kspcb.karnataka.gov.in/waste-management/biomedical-waste

CO – PO MAPPING

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

Semester: III						
National Service Scheme (NSS)						
Course Code	:	BNS310		**Credits**	:	0
Hours/Week(L:T:P)	:	0:0:2		**CIE**	:	100 Marks
Total Hours	:	12 P		**SEE**	:	-
Course Type	:	NCMC		**SEE Duration**	:	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the community in general in which they work
CLO2	Identify the needs and problems of the community and involve them in problem – solving
CLO3	Develop among themselves a sense of social and civic responsibility and utilize their knowledge in finding practical solutions
CLO4	Develop competence required for group-living and sharing of responsibilities and gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
CLO5	Appraise the importance of ethical issues and team working abilities pertaining to the social services.

Activity– 1	**08 Hrs**
Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.	
Activity – 2	**08 Hrs**
Waste management– Public, Private and Govt. organization, 5 R's	
Activity – 3	**08 Hrs**
Setting of the information imparting club for women leading to contribution in social and economic issues	

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.

S. 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 / 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

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 and Govt. Teams / College campus etc.	Group 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

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	Exploit the importance of his / her responsibilities towards society.

CO2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
CO4	Implement government or self-driven projects effectively in the field of societal problems.
CO5	Appraise the importance of ethical issues and team working abilities pertaining to the social services.

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	2		3
CO2		3				3		2	2		3
CO3			3			3	2	2	2		3
CO4						3	2	2	2		3
CO5						2	3	3	2		3

Semester: III						
Physical Education (PE) (Sports and Athletics)						
Course Code	**:**	BPE310		**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:0:2		**CIE**	**:**	100 Marks
Total Hours	**:**	12 P		**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	**04 Hrs**
Orientation A. Lifestyle B. Health and Wellness C. Pre-Fitness test.	
Module – 2	**04 Hrs**
General Fitness and 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.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Elucidate core concepts of physical education, health, nutrition and fitness for personal well-being
CO2	Demonstrate exercises, sports and practices that enhance physical and mental development
CO3	Apply foundational skills for careers in physical education, sports and fitness
CO4	Participate in sports competitions with discipline, teamwork and sportsmanship
CO5	Promote healthy lifestyles through wellness concepts and traditional/indigenous activities

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	1					2	2	2		1
CO2	2	2			2	2	2	2	2		1
CO3	3					2	2				2
CO4	2					2	3	2	2		3
CO5	2				2	3	3	2	2		1

Semester: III						
Yoga						
Course Code	**:**	BYO310		**Credits**	:	0
Hours/Week(L:T:P)	**:**	0:0:2		**CIE**	:	100 Marks
Total Hours	**:**	12 P		**SEE**	:	-
Course Type	**:**	NCMC		**SEE Duration**	:	-

Course Learning Objectives: This course will enable the students to	
CLO1	Explain the history, various schools of yoga along with its aims, objectives and significance in holistic well-being.
CLO2	Demonstrate basic yoga practices and how to do them safely, clearing up common misunderstandings.
CLO3	Apply suryanamaskara with proper understanding of its structure, significance and health benefits.
CLO4	Describe the types, methods and benefits of various Asanas.
CLO5	Utilize the knowledge of specific asanas regularly to improve physical health and mental well-being.

Module - 1	02 Hrs
Introduction to Yoga: Origin, history, and development of Yoga, Meaning and definitions of Yoga, Different schools of Yoga, Aims and objectives of Yoga, Importance of prayer in Yoga practice. **Text Book 1:** Ch.1 (Part 1)	
Module - 2	02 Hrs
Foundations of Yogic Practice: Yogic practices for a common man to promote positive health, Rules to be followed during yogic practices by the practitioner, Misconceptions about Yoga, Difference between yogic and non-yogic practices. **Text Book 1:** Ch.1 (Part 1)	
Module - 3	03 Hrs
Suryanamaskara (Sun Salutation): Prayer and its meaning, Need, Importance and benefits of Suryanamaskara, 12-count structure and practice of 2 rounds. **Text Book 1:** Ch.2 (Part 2)	
Module - 4	02 Hrs
Introduction to Asanas: Asana - Meaning, need, and importance, Classification of Asanas, General technique, precautionary measures, and benefits of each Asana. **Text Book 1:** Ch.1 - 2 (Part 1-2)	
Module - 5	03 Hrs
Types of Asanas and Practice: Sitting Asanas - Padmasana, Vajrasana, Standing Asanas - Vrikshasana, Trikonasana, Prone Lying Asanas - Bhujangasana, Shalabhasana, Supine Lying Asanas - Utthitadvipadasana, Ardhahalasana.	

Text Book 1: Ch.2 (Part 2)	
Course Outcomes: After completing the course, the students will be able to	
CO1	Summarize the history and major schools of yoga, highlighting their purpose in promoting holistic well-being.
CO2	Demonstrate basic yoga practices with correct techniques, ensuring safety and addressing common misconceptions.
CO3	Apply suryanamaskara sequences with proper understanding of its structure, significance, and health benefits.
CO4	Classify the types, methods, and benefits of various asanas with appropriate examples.
CO5	Adopt the practice of specific asanas into a regular routine to enhance physical health and mental well-being.

Text Book	
1	"The Illustrates Light on Yoga" by BKS Iyengar, HarperCollins Publishers,ISBN-81:7223-606-9

Reference Books	
1	"Teaching Methods for Yogic practices" Dr. M L Gharote and 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 Ajith kumar.
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			2		
CO2						2			2		
CO3						2	2	3	2		2
CO4						2			2		
CO5						2	2	3	2		2

Semester: III					
Music					
Course Code	:	BMU310	**Credits**	:	0
Hours/Week(L:T:P)	:	0:0:2	**CIE**	:	100 Marks
Total Hours	:	13 P	**SEE**	:	-
Course Type	:	NCMC	**SEE Duration**	:	-

Course Objectives: This course will enable the students to	
1	Understand the foundational concepts of Indian classical music, including the evolution and structure of Shruthi, Nada, Swara, Laya, Raga, Tala and Mela systems.
2	Recognize and describe various types of Carnatic compositions such as Geethe, Jathi, Swara, Swarajathi, Varna, Krithi and Thillana, along with the basics of the notation system.
3	Appreciate the contributions of key composers like Purandaradasa, Thyagaraja and Mysore Vasudevacharya to Indian music and understand their musical legacy.
4	Identify and explain the classification and basic construction of traditional Indian musical instruments, including string, wind, percussion and idiophones, with appropriate examples.
5	Demonstrate basic vocal proficiency through the practice of Sarale Varase exercises, notations for Suladi Sapta Tala in Mayamalavagowla raga and performance of selected compositions such as Geethe, Jathi Swara and Krithi.

Module -I	**03 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. Origin of the Indian Music: Evolution of the Indian music system, understanding of Shruthi, Nada, Swara, Laya, Raga, Tala, Mela **Text Book 1:V-1**.Ch.1-4	
Module – II	**03 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.	
Module –III	**03 Hrs**
Composers: Biography and contributions of Purandaradasa, Thyagaraja, Mysoro asudevacharya, Kanakadasa **Text Book 3:** Ch.2-5.	
Module –IV	**03 Hrs**
Music Instruments: Classification and construction of string instruments, wind instruments, percussion Instruments, Idiophones (Ghana Vaadya), Examples of each class of instruments. **Text Book 1:V-4**. Ch.2-6.	
Module –V	**14 Hrs**
Abhyasa Gana: Singing the swara exercises (Sarale Varase Only), Botatio writing for sarale varase and sulafi sapta tala (Only in mayamalavagowla raga), singing 4 geethe in malahari and one jathi swara, oe krithi in a mela raga	

Text Book 1: V.1 - 2

Course Outcomes: After completing the course, the students will be able to	
CO1	Outline the evolution of Indian music and key concepts like Shruthi, Swara,Raga and Tala.
CO2	Identify and interpret basic Carnatic compositions using standard notation.
CO3	Summarize the contributions of composers.
CO4	Classify Indian musical instruments and describe their construction and use.
CO5	Demonstrate basic carnatic vocal skills through selected exercises and compositions.

Text Books	
1	"South Indian Music – Vol. I to VI", Prof. P. Sambamoorthy, The Indian Music Publishing House, Chennai.
2	"A Textbook of Carnatic Music", Dr. S. Bhagyalekshmy, CBH Publications.
3	"Karnataka Sangeetha Charitre", Dr. V. S. Sampathkumaracharya, Kannada University, Hampi.

Reference Books	
1	"Music of India", B. Chaitanya Deva, Munshiram Manoharlal Publishers
2	"Essentials of Musicology in South Indian Music", Prof. S. R. Janakiraman, Asian Educational Services.

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	1				1	1	1		1		
CO4	2		2		3	1	1	1	1		1
CO5	3			1	2	1	1	1	1		1

Semester: III						
Competency Enhancement Course-1						
Course Code	**:**	BCE311		**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:2:0		**CIE**	**:**	100 Marks
Total Hours	**:**	40 L		**SEE**	**:**	-
Course Type	**:**	NCMC		**SEE Duration**	**:**	-

Prerequisites:	
Courses	Fundamentals of Mathematics and English
Knowledge on Fundamental Concepts	Arithmetic operations, fractions, decimals, and elementary algebra. comprehension of basic English
Knowledge on Connected Tools	**-**

Course Learning Objectives: This course will enable the students to	
CLO1	Gain a strong foundation in aptitude skills such as number systems, percentages, ratio and 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	**08 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 and Remainder, Multiples and Factors, Integers, LCM and HCF, complete a number Series, Find the Missing Term and Wrong Term, Simplification, BODMAS Rule, Approximation, Decimals,

Fractions, Surds and Indices.

Text Book 1: Ch.1-11

Module – 2	**08 Hrs**

Percentage: Calculation-oriented basic percentage, Successive Selling type, Discount and MP, Dishonest Dealings.

Profit and Loss: Cost Price (CP), Selling Price (SP), Marked Price (MP) / List Price, Discount, Profit (Gain), Loss, Profit Percentage, Loss Percentage, Discount Percentage, Relationship between CP, SP, and Profit/Loss Percentage, Successive Profits and Losses, False Weights and Dishonest Dealer Problems.

Blood Relation: Basic Family Relationships (Parent, Sibling, Child, etc.), Direct Relationship Questions, Pointing or Introducing Type Questions, Family Tree/Hierarchical Relationship Questions, Coded Blood Relations, Puzzle-Based Blood Relations, Mixed/Complex Blood Relations, Single-Person Blood Relation Problems, Generational Relationships (Grandparent, Great-Grandparent, etc.), Relationships by Marriage (In-laws, Step-relations).

Text Book 1: Ch.2-4,Ch.6-7,Ch.10-12

Module – 3	**08 Hrs**

Simple and Compound Interest: Definition of Simple Interest (SI), Calculation of Simple Interest, Principal, Rate, and Time, Amount in Simple Interest, Problems on SI (Direct, Inverse and Combined), Definition of Compound Interest (CI), Calculation of Compound Interest (Annual, Half-yearly, Quarterly, etc.), Difference between Simple and Compound Interest, Growth Factor and Compound Amount, Compound Interest for Fractional Years, Comparing SI and CI over Multiple Years, Depreciation and Appreciation Problems, Installment Payments (EMI-based Questions).

Averages: Definition and Formula of Average, Average of Numbers, Average of Consecutive Numbers, Average of Odd/Even Numbers, Weighted Average, Average in Groups (Merging and Replacement), Effect of Addition/Removal/Replacement on Average, Average Speed, Change in Average Due to Error (Wrong Entry), Shortcut Tricks and Applications

Direction Sense Test: Cardinal and intermediate directions, right and left directional movement, reference points and orientation, turns and angle-based movement, distance and displacement calculation, shadow and sun-based direction problems, shortest path and final position, direction sense using maps or diagrams, coded direction sense problems, complex/multiple person direction scenarios, error spotting in direction sense.

Text Book 1: Ch.2,5.

Module – 4	**08 Hrs**

Ratio and Proportion and Variations: Definition of Ratio, Types of Ratio (Simple, Compound, Duplicate, Sub-duplicate, Triplicate), Properties of Ratio, Comparison of Ratios, Definition of Proportion, Types of Proportion (Direct, Inverse, Continued), Properties of Proportion, Mean Proportion, Fourth Proportion, Third Proportion, Relationship between Ratios and Proportions, Componendo and Dividendo Rules, Addendo and Subtrahendo, Applications of Ratio and Proportion in Problem, Direct Variation, Inverse Variation, Joint Variation, Combined Variation, Proportionality Constants, Word Problems on Variation, Application-based Variation Problems, Miscellaneous and Complex Variation Questions

Alligations and Mixtures: Definition of Alligation, Alligation Rule and Formula, Types of Mixtures (Simple and Compound), Problems on Mixing

Two or More Quantities, Mean Price Calculation, Replacement of Quantities, Alligation on Solutions with Different Concentrations, Solving Alligation Questions Involving Profit and Loss, Application-Based Mixture Problems. **Series:** Arithmetic Series, Geometric Series, Square Series, Cube Series, Fibonacci Series, Prime Number Series, Alternating Series, Factorial Series, Mixed Series, Exponential/Power Series **Text Book1:** Ch.12-13,Ch.16.

Module – 5	**08 Hrs**

Articles and Prepositions: Usage of articles (a, an, the), definite and indefinite articles, zero article usage, prepositions of time, place, direction, phrasal verbs, prepositional phrases, and error spotting.

Tenses and Subject-Verb Agreement: Present, past, and future tense forms, auxiliary verbs, rules of agreement with different subjects, and error spotting

Change of Voice and Speech: Active-passive transformations in all tenses, direct and indirect speech conversions, and related pronoun, tense, and time changes

Error Spotting and Sentence Correction: Identifying common grammatical errors such as incorrect word usage, faulty subject- verb agreement, tense errors, sentence fragments, and contextual sentence corrections

Synonyms, Antonyms, and Verbal Analogy: Finding words with similar or opposite meanings, commonly confused words, verbal analogies, and contextual vocabulary usage

Sentence Completion and One-Word Substitution: Choosing appropriate words or phrases to complete sentences, idiomatic expressions, logical sentence completion, and replacing phrases with single-word substitutes

Text Book 1: Ch14-15,Ch.17,Ch. 29.

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", R.S. Aggarwal Chand Publishing. – 2023.ISBN:10-9352534026
2	"Vedic Mathematics", Bharati Krishna Tirthaji, Sixteenth Reprint, Published by Motilal Banarsidass Publishers, - 1985, (ISBN- 978-8120801639)
3	"Logical and Analytical Reasoning", A.K. Gupta, 39th Edition, Ramesh Publishing House – 2024, (ISBN- 978-9350127766)

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

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

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

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