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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

IV Semester
Scheme & Syllabus of B.E. Programme
Civil Engineering
(2024 Scheme)

Core Values

Spiritual, Judicious, Commitment, Integrity, Trustworthy



AICTE | NIRF NATIONAL INSTITUTIONAL RANKING FRAMEWORK 151-300 | NBA | A+ NAAC | 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

AICTE Approved, Accredited by NBA(CSE, ISE, ECE, ME, CV, AE) and NAAC with 'A+' grade, QS – I Gauge Gold Rated

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

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

4th Semester

CIVIL ENGINEERING												
Sl. No.	**Course Code**	**Course Title**	**Course Type**	**TD/ PSB**	**Teaching Hours / Week**			**Examination**				
					L	**T**	**P**	**SEE Duration (Hrs)**	**CIE Marks**	**SEE Marks**	**Total Marks**	**Credits**
1	BCV401	Structural Analysis	PCC	Civil	3	0	0	**3**	**50**	**50**	**100**	**3**
2	BCV402	Fluid Mechanics and Hydraulic Machines	IPCC	Civil	3	0	2	**3**	**50**	**50**	**100**	**4**
3	BCV403	Transportation Engineering	IPCC	Civil	3	0	2	**3**	**50**	**50**	**100**	**4**
4	BBI404	Biology for Engineers	BSC	Civil	2	0	0	**3**	**50**	**50**	**100**	**2**
5	BCVL405	Computer Aided Building Planning and Drawing	PCCL	Civil	0	0	2	**3**	**50**	**50**	**100**	**1**
6	BCV406x	ESC/ETC/PLC	ESC	Civil	If the course is a Theory: 3	0	0	**3**	**50**	**50**	**100**	**3**
					If the course is a Laboratory: 2	0	2					
7	BUH407	Universal Human Values	UHV	Civil	1	0	0	**1**	**50**	**50**	**100**	**1**
8	BCV408x	Ability Enhancement Course/Skill Enhancement Course – IV	AEC/ SEC	Civil	If the course is a Theory: 1	0	0	**1**	**50**	**50**	**100**	**1**
					If the course is a Laboratory			**2**				

					0	0	2					
9	BMP409	Metaphysical Science	HSSMC	ANY DEPT	1	0	0	**1**	**50**	**50**	**100**	**1**
10	BNS410	National Service Scheme (NSS)	NCMC	NSS Coordinator	0	0	2	-	**100**	-	**100**	**0**
	BPE410	Physical Education (PE) (Sports and Athletics)		Physical Education Director								
	BYO410	Yoga		Yoga Teacher								
	BMU410	Music		Music Teacher								
11	BCE411	Competency Enhancement Course-2	NCMC	CDCAC		2		-	**100**	-	**100**	**0**
									650	**450**	**1100**	**20**

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
BCV406A	Entrepreneurship and Startup Culture	BCV406C	Alternative Building Materials and Technology
BCV406B	Engineering Geology and Practice	BCV406D	Mechanization in Construction

Ability Enhancement Course/Skill Enhancement Course – IV

Course Code	Course Name	Course Code	Course Name
BCV408A	Digital Land Surveying and Mapping (DLS&M)	BCV408C	Construction Skill Laboratory
BCV408B	Introduction to Building Information Modeling	BCV408D	3DS Max, Sketchup and Revit Architecture

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical's 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: IV						
Structural Analysis						
Course Code	**:**	BCV401		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50Marks
Total Hours	**:**	40 L		**SEE**	**:**	50Marks
Course Type	**:**	PCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Strength of Materials
Knowledge on Fundamental Concepts	Basic material behavior, Bending moment and shear force diagrams.
Knowledge on Connected Tools (If any)	**-**

Course Learning Objectives: This course will enable the students to	
CLO1	Identify structural elements and determine the degree of static and kinematic indeterminacy for various structural systems.
CLO2	Use energy principles including virtual work and Castigliano's theorems to compute deflections in structural elements.
CLO3	Compute axial forces, bending moments, and cable lengths in three-hinged arches and suspension cables under point and distributed loads.
CLO4	Formulate and solve structural problems involving slope deflection and moment distribution in continuous beams and frames.
CLO5	Assemble and solve matrix equations for structural analysis using stiffness and flexibility approaches.

Module – 1	**08Hrs**
Introduction to structural systems: Classification of structures: beams, trusses, arches and frames. Load types: dead, live, seismic, snow, thermal and dynamic. Idealization of structures (Structural forms). Compatibility conditions, Degree of freedom, Linear and nonlinear analysis, Static and kinematic indeterminacies of structural systems. **Deflection of beams:** Deflection of determinate beams by Strain energy due to axial force, BM and SF- Principle of virtual work and Castiglione's theorems- Unit load and its application to deflection of determinate beam and truss. **TEXT BOOK 1:** Ch.1: 1.1-1.5, Ch.2: 2.1-2.5, Ch.3: 3.1-3.2Ch.6: 6.1-6.9, Ch.10: 10.1-10.2 **TEXT BOOK 2:** Ch.1: 1.1-1.14, Ch.3: 3.1-3.7	
Module – 2	**08Hrs**
Arches and Cable Structures: Three hinged parabolic arches with supports at the same and different levels. Determination of normal thrust, radial shear and bending moment. Analysis of cables under point loads and UDL. Length of cables for supports at same and different levels- Stiffening trusses for suspension cables. **Influence Lines and Moving Loads:** Concepts of influence lines-ILD for reactions, SF and BM for determinate beams, ILD for axial forces in determinate trusses Reactions, BM	

and SF in determinate beams using rolling loads concept. Influence lines for beams and trusses under moving loads. Criteria for determining maximum shear and moment. **TEXT BOOK 1:** Ch.8: 8.1-8.2, Ch.7: 7.1-7.12 **TEXT BOOK 2:** Ch.2: 2.1-2.6, Ch.3: 3.1-3.3
Module – 3 **08 Hrs**
Slope Deflection Method: Introduction, sign convention, development of slope deflection equation, analysis of continuous beams including settlements, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy≤3. **TEXT BOOK 1:** Ch.11: 11.1-11.6 **TEXT BOOK 2:** Ch.6: 6.1-6.3
Module – 4 **08 Hrs**
Moment Distribution Method: Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy ≤3. **TEXT BOOK 1:** Ch.12: 12.1-12.7 **TEXT BOOK 2:** Ch.9: 9.1-9.3
Module – 5 **08 Hrs**
Matrix Method of Analysis (Flexibility method): Introduction, Axis and Coordinates, Flexibility matrix, analysis of continuous beam and plane trusses using system approach. **Matrix Method of Analysis (Stiffness method):** Introduction, Stiffness matrix, analysis of continuous beam. Analysis of simple orthogonal rigid frames using system approach. **TEXT BOOK 1:** Ch.15:15.1-15.3, Ch.17:17.1-17.4, Ch.18: 18.1-18.7

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify structural systems and static and kinematic indeterminacies of beams, frames, and trusses.
CO2	Apply energy methods (virtual work, Castigliano's theorems) to find deflections in beams, trusses, and frames.
CO3	Analyze arches and cables at various support levels and construct influence lines for long-span structures.
CO4	Evaluate continuous beams and rigid frames using slope deflection and moment distribution methods.
CO5	Formulate beam and truss analysis models using flexibility and stiffness matrix methods.

Text Books	
1	"Basic Structural Analysis", Reddy, C.S., 3rd ed., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2011. · ISBN: 9780070702769
2	"Theory of Structures Vol-1", Pandit and Gupta. Tata McGraw Hill, New Delhi, 1st Edition, 2017,ISBN: 978007463493

Reference Books	
1	"Theory of Structures", S. Ramamrutham, 9th Edition, Dhanpat Rai Publishing Company Private Limited, New Delhi, 2014, ISBN-13: 978-

	9384378103.
2	"Structural Analysis", S S Bhavikatti, 5th Edition, Vikas publishing house Pvt. Ltd. , new Delhi, 2021, ISBN-13**:** 978-81-947519-8-4
3	"Elementary Structural Analysis", Norris C.H., Wilbur J.B., 3rd Edition, McGraw Hill Internationa1 Book,2016, ISBN 13: 9352604717
4	"Structural Analysis", Hibbeler, R.C, 9th edition., Pearson publications., New Delhi, 2012.ISBN: 9789332586147

Web links and Video Lectures (e – Resources)	
1	NPTEL- IIT Delhi https://archive.nptel.ac.in/courses/105/105/105105166/
2	NPTEL-IIT Kharagpur: https://nptel.ac.in/courses/105105166

CO – PO MAPPING

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

Semester: IV						
Fluid Mechanics and Hydraulic Machines						
Course Code	:	BCV402		**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 Mathematics I, Engineering Physics,
Knowledge on Fundamental Concepts	Calculus, Differential Equations, Basic Mechanics, Properties of matter
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand fundamental fluid properties and hydrostatic laws for fluid pressure.
CLO2	Analyse fluid kinematics and dynamics principles with engineering applications.
CLO3	Explore flow measurement methods and design pipe flow systems with energy loss calculations.
CLO4	Design open channels based on flow properties and energy principles.
CLO5	Apply principles, classifications and performance analysis of hydraulic turbines and pumps in practical scenarios

Module – 1	**08 Hrs**
Fluids and Their Properties – Units and Dimensions- Properties of Fluids- Mass Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity, Compressibility, Vapor Pressure, Surface Tension and Capillarity. **Fluid Statics:** Basic Definition, Hydro Statics Law, Pascal's Law, Manometers, Total Pressure and Center of Pressure on Vertical and Inclined Plane Surfaces. **Text Book 1:** Ch.1:1.2 -1.6, Ch. 2: 2.2 - 2.7.	
Module – 2	**08 Hrs**
Kinematics of Fluids: Types of Fluid Flow: Steady and Unsteady, Uniform and Non-Uniform, One, Two and Three-Dimensional Flow, Laminar and Turbulent, Rotational and Irrotational, Compressible and Incompressible Flow, Rate of Flow, Derivation of Three-Dimensional Continuity Equation in Differential Form, Related Problems. **Dynamics of Fluid Flow:** Derivation of Euler's Equation and Bernoulli's Equation with Assumption and Limitation, Problem on Bernoulli's Equation with and Without Losses, Application of Bernoulli's Equation - Venturimeter, Orifice Meter and Pitot Tube Related Problems.**Text Book 1:** Ch.5 : 5.2 – 5.6 , Ch.6: 6.4 - 6.7.	
Module – 3	**08 Hrs**
Notches, Orifices and Mouthpieces: Classification, Hydraulic Coefficients, Discharge Over Rectangular, Triangular and Cipoletti Notch, **Flow Through Pipes:** Major and Minor Losses, Pipes in Series and Parallel, Equivalent Pipe. Concept of Water Hammer and Surge Tanks. **Text Book 1:** Ch. 7: 7.2 - 7.4, 7.12-7.15.	
Module – 4	**08 Hrs**
Flow in Open Channels: Classification of Flow in Channel, Geometric Properties of Open Channels, Chezy's and Manning's Equation (No Derivation) and Related Problem, Most Economical Open Channels-Derivation for Rectangle, Trapezoidal and Circular Sections and Related Numerical.	

Specific Energy: Introduction, Specific Energy Curve, Conditions for Minimum Specific Energy and Maximum Discharge, Critical Flow in Rectangular Channels and Related Numerical, Hydraulic Jump in Rectangular Channels and Related Numerical. **Text Book 1:** Ch 16: 16.2 - 16.8

Module – 5	**08 Hrs**
Impact of Jet On Vanes: Impact of Jet on Stationary and Moving Flat Vanes – Vertical, Inclined, Curved and Related Numerical Concept of Velocity Triangles. **Pumps:** Classification, Centrifugal, Reciprocating Pumps, Components, Working Principle and Efficiencies (No Derivation), Air Lock and Related Simple Numerical, Concept of Stages in Centrifugal Pump, Priming, Cavitation. **Turbines:** Introduction to Turbines, Classification of Turbines, Heads and Efficiencies of Turbine, Pelton Wheel and Francis Turbine Components, Working Principle and Hydraulic Efficiencies (No Derivation) and Related Simple Numerical. **Text Book 1:** Ch.17: 17.2 -17.4, Ch.18: 18.2 -18.9, Ch.19: 19.1 -19.9.	

PRACTICAL COMPONENT OF IPCC

Sl No	**Experiments** **12 Lab Sessions**
1	Verification of Bernoulli's equation
2	Calibration of Venturimeter /Orifice meter
3	Calibration of notches and weirs
4	Determination of major /minor losses in pipes
5	Determination of efficiency of jet on flat and curved vanes
6	Demo of determination of efficiency of centrifugal pump
7	Demo of determination of efficiency of Francis turbine
8	Demo of determination of efficiency of Pelton wheel

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the Fundamental Properties of Fluids and Hydrostatic Laws to Measure Fluid Pressure.
CO2	Analyze Fluid Motion using Kinematic and Hydrodynamic Principles.
CO3	Design Pipe Flow Systems Considering Energy Losses and Efficiency.
CO4	Design Open Channel Flow Systems By Applying Energy Concepts.
CO5	Analyze Performance Characteristics of Hydraulic Turbines and Pumps In Real-World Applications.

Text Books	
1	"Fluid Mechanics and Hydraulic Machines", Dr. R.K. Bansal, Lakshmi Publications, 9th Edition 2017. ISBN-10. 8170083117

Reference Books	
1	"Fluid Mechanics" John F. Douglas, Gasiorek and Swaffield Prentice Hall, 6th edition 2011. ISBN-13, 978-0273717720.
2	"Fluid Mechanics in SI Units", Russell C. Hibbeler Pearson Publication 1st Edition 2016. ISBN-13. 978-9332547018.
3	"Open Channel Hydraulics", Vente Chow, McGraw Hill Publications 2009. ISBN 13: 9780070859067.
4	"Fluid Mechanics"-SI Version". Munson, Okiishi Wiley Publishers 7th edition 2015. ISBN-13, 978-8126553433.

5	"Hydraulics and Fluid Mechanics", P.N. Modi and S.M. Seth, Standard Book House, 20th edition, 2017. ISBN-13: 9788189401269.
6	"A Textbook of Fluid Mechanics and Hydraulic Machines", R. K. Rajput, S. Chand and Company Ltd. 11th 2011 Reprint. ISBN : 9789385401374.

Web links and Video Lectures (e – Resources)	
1	Properties of fluid: https://www.youtube.com/watch?v=TgD3nEO1iCA
2	Fluid Mechanics: Fundamental Concepts, Fluid Properties: https://www.youtube.com/watch?v=clVwKynHpB0
3	Fluid Kinematics: https://www.youtube.com/watch?v=NIl2BAQSde0
4	Flow Through Pipes: https://www.youtube.com/watch?v=f0TRQq8k3Vc
5	Flow in open channels: https://www.youtube.com/watch?v=DxKJnR-Lnf4
6	Impact of jet on vanes: https://www.youtube.com/watch?v=7HGR_jAx7OU
7	Hydraulic Turbines: https://www.youtube.com/watch?v=9M4peF-_Bv8&list=PLdoIhVhbPQV7Wq_iGNvmrf-r-xYZYzRBO&index=1

CO – PO MAPPING

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

Semester: IV						
Transportation Engineering						
Course Code	:	BCV403		**Credits**	:	04
Hours/Week(L:T:P:S)	:	3:0:2		**CIE**	:	50 Marks
Total Hours	:	40 L + 12 P		**SEE**	:	50 Marks
Course Type	:	IPCC		**SEE Duration**	:	03 Hours

Prerequisites	
Courses	Engineering Mechanics, Engineering survey.
Knowledge on Fundamental Concepts	Understanding these fundamental concepts, transportation engineers work to design and manage systems that are efficient, safe, environmentally friendly, and sustainable.
Knowledge on Connected Tools (If any)	**-**

Course Learning Objectives: This course will enable the students to	
CLO1	Gain knowledge of different modes of transportation systems and to learn the introductory concepts on Highway Engineering.
CLO2	Get insight to different highway materials and pavement design elements of a highway network.
CLO3	Realize the significance of road safety by incorporating the concepts of traffic engineering.
CLO4	Understand to different aspects of geometric elements of railway system and evaluate the material quantity required for track laying.
CLO5	Gain knowledge about various components of an airport and its runway design.

Module – 1	**08 Hrs**
Introduction: Different Modes of Transportation (Airways, Waterways, Land ways - Monorail, Metrorail, etc), M R Jayakar Committee recommendations, Road classifications and road patterns, Highway Alignment- Factors affecting highway alignment, Engineering surveys for alignment conventional and modern methods. **Highway Geometric Design:** Factors affecting geometric design of roads, Cross Sectional Elements, Sight distances, Horizontal alignment- Transition curve, super elevation, Extra widening, Vertical alignment–gradients, summit and valley curves. (**No derivations**) Problems on Sight distance, Super elevation, extra widening of curves, Length of transition curve, Length of summit and valley curve. **Text Book 1:** Ch.1, Ch.3 – 4.	
Module – 2	**08 Hrs**
Highway materials and pavements: Desirable properties of aggregates, soil subgrade and Bitumen, Application of bituminous emulsion, Desirable properties of Bituminous Mixes. **Pavement design:** Factors Controlling design of highway pavements, Pavement types- Flexible and Rigid, component parts of pavements and their functions; types of joints used in rigid pavement. Critical stresses in flexible and rigid pavement. **MoRTH** specifications, Road/ Highway furniture, Road markings.	

Highway drainage: Significance and requirements, Surface drainage system and Design-Examples, sub surface drainage system, Types of cross drainage structures their choice and location. (No Numerical on design of Longitudinal drain).
Text Book 1: Ch.6- 7, Ch.11

Module – 3	**08 Hrs**

Traffic engineering: AI Technologies Shaping the Future of Road Engineering.
Traffic characteristics: Traffic survey**,** Road user characteristics, vehicular characteristics – static and dynamic characteristics, Reaction time of driver and PIEV theory, Types of traffic engineering studies-volume, spot speed, speed and delay, parking, accident, origin and destination, objectives of studies and data collection, method of study, analysis. PCU concept, factors affecting and PCU at different locations and applications. New technology in transportation engineering.
Problems on Spot speed studies, Speed and delay studies.
Text Book 1: Ch.5**.**

Module – 4	**08 Hrs**

Railway engineering: Permanent way and its requirements, Gauges and types, Typical cross sections single and double-line BG track.
Sleepers and ballast: Functions, requirements, Track fitting and fasteners, Calculation of quantity of materials required for laying a track, Points and crossings, Railway Station and Yards. Metro train and high speed train- Design factors considered. Hyper loop: The future of rail technology, Anti-collision systems.
Problem on Quantity calculation for laying railway track. Super-elevation**.**
Text Book 2: Ch.2

Module – 5	**08 Hrs**

Airport engineering: Layout of an airport with component parts and functions (Air side, Land side), Site selection for airport, Aircraft characteristics affecting the design and planning of airport, Airport classification, Runway orientation using wind-rose with examples.
Runway-Basic runway length-Corrections and examples, Runway geometrics, Taxiway-Factors affecting the layout - geometrics of taxiway-Comparison between Runway and Highway, Design of exit taxiway with examples, Runway markings.
Problems on Runway orientation, Basic Runway length, Exit taxiway design**.**
Text Book 3: Ch.1-2.

PRACTICAL COMPONENT OF IPCC

Sl. No.	**Experiments** **12 Lab Sessions**
1	Tests on Aggregates (a). Crushing Strength Test (b). Los Angeles abrasion test (c). Impact test (d). Shape tests (combined index and angularity number)
2	Tests on Bituminous Materials (a). Penetration test (b). Ductility test (c). Softening point test (d). Specific gravity test (e). Viscosity test by tar viscometer
3	Tests on Soil: (a). Wet sieve analysis (b). CBR Test on soil
4	Design of flexible pavement as per IRC 37-2018
5	Design of Rigid pavement as per IRC 58-2015

6	Bituminous Mix Design by Marshall Method (Demonstration only)
7	Traffic Engineering studies – Case study

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain the principles of highway alignment and geometric design for efficient and safe road planning.
CO2	Identify the properties, design principals and drainage systems essential for effective highway pavement engineering.
CO3	Analyze traffic characteristics and engineering studies using AI technology to improve road engineering solutions.
CO4	Explain the basics of railway track design, materials, and new rail technologies.
CO5	Design airport layouts and runways, and solve practical problems related to runway orientation, length, and taxiway design.

Text Books	
1	"Highway Engineering", S K Khanna and C E G Just, Nem Chand Bros, Roorkee. Nem Chand and Sons 2017 Revised 10th Edition, ISBN-10. 8185240930.
2	"A Textbook of Railway Engineering",Saxena S. C, Genre · Technology and Engineering , 8th edition, published in 2024. ISBN · 9788189928834.
3	"Airport Engineering", Saxena S.C,CBS Publishers and Distributors, Genre: Technology and Engineering: published in Jan 30 2023, ISBN: 9788123915500.

Reference Books	
1	"Transportation Engineering" C. Jotin Khisty, B.Kent Lall PHI Learning Pvt. Ltd 3rd Edition (2002).ISBN: 9332569706.
2	"Road materials andPavement Design" E.J. Yoder, M.W.Witczak Wiley India Pvt Ltd; 2nd edition (2011).ISBN: 8126530724.
3	"Highway Engineering", L R Kadiyali, Khanna Publishers, New Delhi. 2005.ISBN: 9386173131.
4	"Pavement Design and Materials", A. T. Papagiannakis and E. A. Masad John Wiley and Sons 2008. ISBN:9780471214618.
5	"Highway Materials Testing Laboratory Manual", S K Khanna, C E G Justo and A Veeraragavan, Nem Chand Bros, Roorkee. ISBN: 8185240213.
6	"Introduction to Transportation Engineering", James H Banks McGraw. Hill Publications 2010. ISBN-10. 9780070702462.
7	"Specifications for Roads and Bridges MORTH Specifications", IRC Indian Road Congress Publications 2013.
8	"IRC:37-2018 and IRC:58-2015" ,Codes IRC Indian Road Congress Publications, Periodical edition

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/105101087
2	https://onlinemanuals.txdot.gov/txdotmanuals/rdw/horizontal_alignment.htm#BGBHGEGC
3	www.civil.iitb.ac.in/tvm/1111_nptel/567_Grade/plain/plain.html

4	https://www.pavementinteractive.org/
5	https://www.eng.auburn.edu/research/centers/ncat/research/other-publications.html
6	https://nptel.ac.in/courses/105/106/105106203/
7	https://nptel.ac.in/courses/105/101/105101008
8	https://nptel.ac.in/courses/105/104/105104098
9	https://www.classcentral.com/course/edx-intro-to-traffic-flow-modeling-andintelligenttransport-systems-12728

CO – PO MAPPING

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

Semester: IV						
Biology for Engineers						
Course Code	**:**	BBI404		**Credits**	**:**	2
Hours/Week(L:T:P)	**:**	2:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	30 L		**SEE**	**:**	50 Marks
Course Type	**:**	BSC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Biology, Chemistry
Knowledge on Fundamental Concepts	-
Knowledge on Connected Tools	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the fundamental biological structures and biomolecules
CLO2	Analyze the practical applications of biomolecules in biotechnology and daily life.
CLO3	Relate human organ systems to engineered designs and solutions
CLO4	Appreciate bioinspired materials and mechanisms derived from nature
CLO5	Explore emerging trends in bioengineering and biotechnology

Module – 1	**06 Hrs**
Introduction to Biology: The cell, the basic unit of life, Structure and functions of a cell. The Plant Cell and animal cell, Prokaryotic and Eukaryotic cell, Stem cells and their application. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, proteins, lipids. Importance of special biomolecules; Enzymes (Classification (with one example each), Properties and functions), vitamins and hormones. **Text Book 1:** Ch.1 – 4. **Text Book 2:** Ch.3 - 4 **Text Book 3:** Ch.1 – 3 **Text Book 4:** Ch.2 - 4	
Module – 2	**06 Hrs**
Biomolecules and Their Applications (Qualitative): Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics), Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19, Forensics – DNA fingerprinting), Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins), lipids (biodiesel, cleaning agents/detergents), Enzymes (glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching). **Text Book 1:** Ch.5 – 6 **Text Book 2:** Ch.4, Ch.20 **Text Book 3:** Ch.5, **Text Book 4:** Ch.7- 8**.**	
Module-3	**06 Hrs**

Human Organ Systems and Bio Designs (Qualitative): Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease).Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye). Heart as a pump system (architecture, electrical signaling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators). Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine). Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems).
Text Book 1: Ch.7-11
Text Book 2: Ch.7, Ch.10, C h . 13, Ch.16 -17
Text Book 3: Ch.6
Text Book 4: Ch.9 - 10**.**

Module-4	**06 Hrs**

Nature-Bioinspired Materials and Mechanisms (Qualitative): Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and per flouro carbons (PFCs).
Text Book 1: Ch.12 -13
Text Book 2: Ch.2 - 3
Text Book 3: Ch. 7
Text Book 4: Ch.12 - 14.

Module-5	**06 Hrs**

Trends in Bioengineering (Qualitative)
Muscular and Skeletal Systems as scaffolds (architecture, mechanisms, bioengineering solutions for muscular dystrophy and osteoporosis), scaffolds and tissue engineering, Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D printed foods. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Self-healing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).
Text Book 1: Ch.14 -15
Text Book 2: Ch.20
Text Book 3: Ch. 8
Text Book 4: Ch.15

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the structure and function of cells and major biomolecules essential for life processes.
CO2	Describe the applications of biomolecules in healthcare, environment, and biotechnology.
CO3	Elucidate the human organ systems using engineering analogies and identify associated bioengineering interventions.

CO4	Illustrate nature-inspired biological mechanisms and their technological applications in engineering and material science.
CO5	Discuss emerging trends and tools in bioengineering for diagnostics,therapeutics and environmental sustainability.

Text Books	
1	"Biology for Engineers", Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao, N Publishing, Bengaluru, 2023.ISBN: 9789392549014
2	"Human Physiology", Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022.ISBN: 978-1260720464
3	"Biology for Engineers", Thyagarajan S., Selvamurugan N., Rajesh M.P.,Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw- Hill, New Delhi, 2012.ISBN: 9781121439931
4	"Biology for Engineers", Arthur T. Johnson, CRC Press, Taylor and Francis, 2011,ISBN-10: 0-19-569613-1

Reference Books	
1	"Biomedical Instrumentation", Leslie Cromwell, Prentice Hall 2011. ISBN:978-8120306530
2	"Biology for Engineers", Sohini Singh and Tanu Allen, Vayu Education of India,New Delhi, 2014.ISBN:9789383758265
3	"Biomimetics: Nature-Based Innovation", Yoseph Bar-Cohen, 1st edition, 2012,CRC Press.ISBN: 978-1439834763

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/121106008
2	https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
3	https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering- design-spring-2009
4	https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j- spring-2006
5	https://www.coursera.org/courses?query=biology
6	https://onlinecourses.nptel.ac.in/noc19_ge31/preview
7	https://www.classcentral.com/subject/biology
8	https://www.futurelearn.com/courses/biology-basic-concepts

CO – PO MAPPING

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

Semester: IV						
Computer aided Building Planning and Drawing						
Course Code	**:**	BCVL405		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	0: 0: 2		**CIE**	**:**	50 Marks
Total Hours	**:**	12 P		**SEE**	**:**	50 Marks
Course Type	**:**	PCCL		**SEE Duration**	**:**	03 Hours

Prerequisites:	
Courses	Elements of Civil Engineering.
Knowledge on Fundamental Concepts	Units, Scale.
Knowledge on Connected Tools (If any)	Solid Edge

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the basic tools and commands in AutoCAD.
CLO2	Draw building elements in AutoCAD.
CLO3	Analyze building planning principles and site selection criteria
CLO4	Evaluate real-world building drawings through field visits.
CLO5	Design complete building plans with services.

Experiments **12 Lab Sessions**
1. Introduction Autodesk AutoCAD Software: 2. Drawing standard sections for Footing/Foundation – Size Stone Masonry Foundation, Isolated, Combined footing, 3. Drawing standard sections for Lintel and Chajja. 4. Drawing standard sections for RCC Slabs and Beams. 5. Different types of staircases: Plan and section Drawing of Dog legged and Open well. 6. Drawing of plan, elevation and sectional elevation of Single and double story residential building. 7. Drawing of plan, elevation and sectional elevation of School building. 8. Drawing of plan, elevation and sectional elevation of Hostel building. 9. Drawing of plan, elevation and sectional elevation of Hospital building. **Note:** One compulsory field visit and report should be submitted

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the basics of CAD tools and their functions.
CO2	Identify the different building elements and prepare 2D drawings using AutoCAD.
CO3	Analyse and interpret real world building drawings through field visits to enhance practical knowledge.
CO4	Apply planning rules, building bye-laws and NBC guidelines to design of residential and public buildings.
CO5	Develop working and submission drawings of building in a professional set up.

Text Books	
1	"Building drawing with an integrated approach to built environment drawing", M G Shah, C M Kale, S Y Patki, Tata McGraw Hill Publishing Co. Ltd, New Delhi.

Reference Books	
1	"Building Construction", Gurucharan Singh, Standard Publishers and distributors, New Delhi. ISBN-13: 9788189401214
2	"Civil Engineering Drawing", Malik R S and A Meo G S, Asian Publishers/ Computech Publication Pvt Ltd. ISBN-10: 8173180024

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=4YGfI0Pdpng
2	https://www.youtube.com/watch?v=3n1NtEoBTU4
3	https://www.youtube.com/watch?v=ceHYo-7XbYE&pp=ygULI3NvbGlkX3NsYWI%3D
4	https://www.youtube.com/watch?v=APhVFtrQm5k
5	https://www.youtube.com/watch?v=LeeguTosmHA&pp=0gcJCfwAo7VqN5tD
6	https://www.youtube.com/watch?v=yT8IHC5KEUE

CO – PO MAPPING

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

Semester: IV						
Entrepreneurship and Startup Culture						
Course Code	**:**	BCV406A		**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	Innovation and Design Thinking
Knowledge on Fundamental Concepts	Basic knowledge of business fundamentals and Strong communication skills
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	To make students familiar with the basic concepts in the area of entrepreneurship and importance of entrepreneurship for economic development.
CLO2	To develop personal creativity and entrepreneurial initiatives in the elaboration of business idea.
CLO3	To enable them to understand the stages of the entrepreneurial process and the resources needed for the successful development of entrepreneurial ventures.
CLO4	To develop students' ability to create innovative ventures by leveraging new technologies and processes to capture emerging markets, enhance organizational effectiveness, and compete globally.
CLO5	To manage and strategies effectively throughout the journey of startup, in a time when it is aspired highly by the economy and society.

Module – 1	**08 Hrs**
Introduction: Entrepreneur and Entrepreneurship; Role of Entrepreneurship in economic development; Entrepreneurial Competencies and motivation; Institutional Interface for Small scale Industry/Enterprises/ Startups. **Text Book 1:** Ch.1**.**	
Module – 2	**08 Hrs**
Establishing Startups: Opportunity Scanning and Identification; Creativity and product development process; market survey and assessment; Innovation trail; Choice of technology and selection of business sites. **Text Book 1:** Ch.1, Ch. 6 **Text Book 2:** Ch.13	
Module – 3	**08 Hrs**
Planning a Small Scale Enterprises/Startups: Financing small enterprises/Startups; Government funding agencies to support Startups and small enterprises (SSI, KVIC, MSME-DO, NSIC, NIESBUD, IIE, SIDC, SDIs, DICs NGOs, Industry Association, SIDBI) and SFCs - Self-help Groups - Technological Up-gradation – Challenges, Types of financing (Venture Capitalist, Angel fund, Institutional fund/FIIs), Strategies, GTM; Techno Economic Feasibility Assessment. **Text Book 1:** Ch.6, Ch. 8 -9, **Text Book 2:** Ch.31	

Module – 4	08 Hrs
Creating New Businesses: Capturing new markets for startups, enhancing organizational effectiveness occur through innovation, transforming processes- or both. New technologies, processes, global competition. **Text Book 1:** Ch.5 - 6,	
Module – 5	**08 Hrs**
Business Strategies: Successful strategies for business models, frameworks, funding, barriers and risks for introducing break-through products and services; Preparation of business Plan; Business model innovation, human cantered and design-driven innovation, Knowledge and change management. **Text Book 1:** Ch.5 – 6, Ch.12	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand entrepreneurship and entrepreneurial process and its significance in economic development.
CO2	Develop an idea of the support structure and promotional agencies assisting ethical entrepreneurship.
CO3	Identify entrepreneurial opportunities, support and resource requirements to launch a new venture within legal and formal framework.
CO4	Evaluate an opportunity and prepare a business plan to communicate business ideas effectively.
CO5	Comprehend the stages of establishment, growth, barriers and causes of sickness in industry to initiate appropriate strategies for operation, stabilization and growth.

Text Books	
1.	"Entrepreneurship: A South-Asian Perspective", D.F. Kuratko and T.V. Rao, Cengage Learning, 2012/2013, ISBN: 9788131517161 8131517160
2.	"Entrepreneurial Development, Dr. S.S. Khanka", (4th ed.), S Chand and Company Ltd., 2012. ISBN-13: 9788121918015, ISBN-10:8121918014

Reference Books	
1	"Protect Preparation, Appraisal, Implementation", Prasanna Chandra, Tata McGraw Hill. New Delhi. (2019). ISBN-10. 0074516280
2	"Entrepreneurial Development", Srinivasan, N.P. and Gupta, C.B.) Sultan Chand and Sons,2017. ISBN: 93-5161-132-5
3	"Entrepreneurship: Successfully launching new ventures", Barringer, Bruce R. Pearson Education, India. 2008, ISBN-13. 978-1292404547
4	"Management of Small-Scale Enterprises", Dr. Vasant Desai, Himalaya Publishing House, 2004. ISBN, 9350973405
5	"Developing Start-up Enterprises",Iwona Skalna, Aleksandra Gąsior, , Illustrations Published October 28, 2024 by Routledge. ISBN 9781032775326

Web links and Video Lectures (e – Resources)	
1	https://dde.pondiuni.edu.in/files/StudyMaterials/MBA/MBA3SemesterElective/3EntrepreneurshipandStartup.pdf.
2	https://www.youtube.com/watch?v=Tzzfd6168jk
3	https://www.youtube.com/watch?v=oGf1n3uPhd8

CO – PO MAPPING

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

Semester: IV						
Engineering Geology and Practice						
Course Code	**:**	BCV406B		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	ETC		**SEE Duration**	**:**	3 Hours

Prerequisites	
Courses	Elements of Civil Engineering
Knowledge on Fundamental Concepts	Basic Science
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Understand Earth's internal forces and their impact on civil engineering structures, including seismic and volcanic hazards.
CLO2	Interpret Earth's internal and surface processes, and evaluate their impacts on construction projects
CLO3	Identify minerals and rocks used in construction and assess their engineering properties.
CLO4	Apply geological and geotechnical investigation techniques to know site suitability for construction projects
CLO5	Apply modern geotechnical tools for disaster mitigation and sustainable engineering practices.

Module – 1	**08 Hrs**
Earth's Internal forces, and Disaster: Interior of the Earth: Introduction to Geology and its importance in Civil Engineering Practices, Broad Internal structure and Composition of the Earth's internal dynamic forces, its episodic outburst and disaster on the earth, Geo Dynamics (Endogenous processes): Earthquakes, tsunamis, volcanoes, -Vulnerability of the land to earths internal forces, Zonation with regard earths internal forces, seismic proof structure. **Self-Study:** Determination of Dip and Strike by Geometric methods. **Text Book 1:** Ch. 1 - 3 **Text Book 2:** Ch. 1, Ch. 4	
Module – 2	**08 Hrs**
Earth Surface Process: Earth Surface Process, Weathering, - Physical and Chemical, **Earth surface process:** Earth surface process, weathering, - Physical and Chemical, riverbank and coastal Erosion, - coastal profile, different landforms, deposition and choking of valleys, siltation in navigational channels, Mass movement (earths materials-soil and water) landslide disaster, and floods, Landforms, Drainage basin characteristics, drainage types, erosional valleys, tectonic controlled drainage, drainage basin Engineering. **Self-Study:** Determination of thickness of the bed, Vertical, True thickness and width of the outcrops using trigonometric method. **Text Book 1:** Ch. 4 - 6 **Text Book 2:** Ch. 2 - 4	
Module – 3	**08 Hrs**

Soil minerals and Mineral based Industry: Mineral properties, composition, and their use in the manufacture of construction Materials – Quartz Group (Glass); Feldspar Group (Ceramic wares and Flooring tiles); Kaolin (Paper, paint and textile); Asbestos (AC sheets); Carbonate Group (Cement); Gypsum (POP, gypsum sheets, cement); Mica Group (Electrical industries); Ore minerals - Iron ores (Steel); Chromite (Alloy); Bauxite (aluminium); Chalcopyrite (copper). Amphibole and pyroxene group. Soil group minerals and injurious minerals Hydrogeology and Site investigation for major Engineering projects Dip and strike of beds, fold's fault and joints their significance and recognition. Groundwater Exploration -Water Bearing Formations, Aquifer types and parameters - Porosity, Specific yield and retention, Permeability, Transmissibility and Storage Coefficient. Electrical Resistivity, Resistivity curves.

Self-Study: Cross section of geological maps and its interpretation for civil engineering projects.

Text Book 1: Ch. 7 - 9

Text Book 2: Ch. 2 - 5

Module – 4	**08 Hrs**

Geological Site Investigations: Types of dams, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Rock Mechanics - Definition of rock: Geological classification of rocks into igneous, Sedimentary, and metamorphic rocks. Their distinguishing features, megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble, and Slate.

Self-Study: Identification of minerals based on physical properties for its application. Identification of rocks for their specific application in civil engineering projects based on physical properties (density, porosity, and permeability)

Text Book 1: Ch.7-11

Text Book 2: Ch. 3, Ch.5

Module – 5	**08 Hrs**

Tunnelling, Effects of Tunnelling on the ground: Role of Geological Considerations (lithological, structural, and ground water) in Tunnelling over break and lining in tunnels. Blasting Operations, Methods, Materials and Quantity estimation, precautions and limitations, Tunnelling using TBMs. Geological Application using modern tools and techniques in Civil Engineering: Concept of PIS and GPS for natural resource mapping. Satellite image applications and assessing in Impact of Mining, Quarrying and Reservoirs on Environment and Natural Disaster mitigation.

Self-Study: Toposheets reading, Interpretation and extraction of basic information Visual Interpretation of Satellite Images

Text Book 1: Ch.11-13

Text Book 2: Ch.5

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify earth surface processes like weathering, erosion, floods, and landslides, and apply concepts in terrain evaluation.
CO2	Classify rock-forming and industrial minerals, and assess their applications in construction and soil engineering.
CO3	Interpret geological maps, structures (dip, strike, faults, folds), and evaluate groundwater-bearing formations.
CO4	Assess geological aspects in site selection and design of dams, tunnels, and other large-scale civil infrastructure.

CO5	Apply remote sensing, GPS, and modern geological techniques for resource mapping and disaster mitigation.

Text Books	
1.	"Engineering Geology for Civil Engineers" Venkat Reddy D I, IBH Publishing Co. Pvt. Ltd, January 2017, ISBN-13: 978-9385998881.
2.	"A Textbook of Geology", Mukerjee P.K. World Press Pvt., Ltd., Calcutta, 13th Edition/2006, ISBN-13: 978-8184241273.

Reference Books	
1	"Principles of Engineering Geology and Geotechnics" ,Dimitri P Krynine, William R Judd, CBS publishers and Distributors, 2003, ISBN-13: 978-8123904513.
2	"A textbook of Engineering Geology" ,Chenna Kesavulu, Mac Millan India Ltd, 1996, ISBN-13: 978-0333923644.

Web links and Video Lectures (e – Resources)	
1	https://youtu.be/aTVDiRtRook
2	https://youtu.be/MWs5id2_-sY
3	https://youtu.be/sTY-ao4RZck

CO – PO MAPPING

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

Semester: IV						
Alternative Building Materials and Technology						
Course Code	**:**	BCV406C		**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	Building Materials and Construction Technology
Knowledge on Fundamental Concepts	Properties of Materials
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the Principles and Benefits of using Alternative Building Materials.
CLO2	Identify different Types of Alternative Building Materials and their Properties.
CLO3	Apply alternative Building Materials in Design and Construction.
CLO4	Assess the Environmental Impact of Different Building Materials.
CLO5	Develop a Sustainable Approach to Construction.

Module – 1	**08 Hrs**
Energy in Building Materials, Environmental Issues Concerned to Building Materials: Embodied Energy and Life-Cycle Energy, Global Warming and Construction Industry, Green Concepts in Buildings, Green Building Ratings – IGBC and LEED Manuals – Mandatory Requirements, Rainwater Harvesting and Solar Passive Architecture. Environmental Friendly and Cost Effective Building Technologies, Requirements for Buildings of Different Climatic Regions. Codal Provisions. **Text Book 1:** Ch.1: 1.1 - 1.5	
Module – 2	**08 Hrs**
Alternatives to Cement, Mortars and Masonry Units: Alternative Cements and Fine Aggregates, Mortars, Types, Preparation, Properties, Masonry Materials, Classification and Properties of Mortars, Selection of Mortars. Manufacturing Process and Characteristics of Alternative Masonry Units -Stabilized Mud Blocks, Geo Polymer, Fal- G Blocks, Aerated Concrete Blocks etc - Strength, Modulus of Elasticity and Water Absorption. Polymer Mortars. Codal Provisions. **Text Book 1:** Ch. 2:2.1 - 2.8, Ch. 8: 8.1 - 8.6	
Module – 3	**08 Hrs**
Use of Agro Based Materials, Industrial By-Products and Manufactured Aggregates: Building Materials from Agro and Industrial Wastes, Types of Agro Wastes, Types of Industrial and Mine Wastes, Properties and Applications, Different Materials Used as Alternatives Such as C&D Waste, Crumb Rubber, Fibre Reinforced Polymer, Crushed Stone Aggregates (Manufactured Aggregates), Lime-Pozzolana Cements- Raw Materials, Manufacturing Process, Properties and Uses. Codal Provisions. **Text Book 1:** Ch.6: 6.1 - 6.5	
Module – 4	**08 Hrs**
Alternative Construction Systems: Use of Arches in Foundation, Alternatives for Wall Constructions, Composite Masonry, Confined Masonry, Cavity Walls, AAC Walls, Rammed Earth, Ferro Cement and Ferroconcrete Building Components, Materials and Specifications, Properties, Construction Methods, Applications. Top Down Construction, MIVAN Construction Technique. Codal Provisions.	

Alternate Roofing Systems: Concepts, Filler Slabs, Composite Beam Panel Roofs, Masonry Vaults and Domes. **Text Book 1:** Ch. 7: 7.1-7.2, Ch. 9:9.1- 9.10, Ch. 11:11.1-11.3	
Module – 5	**08 Hrs**
Equipment for Production of Alternate Materials: Machines for Manufacture of Concrete, Equipments for Production of Stabilized Blocks, Moulds and Methods of Production of Precast Elements, Cost Concepts in Buildings, Cost Saving Techniques in Planning, Design and Construction, Cost Analysis: Case Studies Using Alternatives. Codal Provisions. **Text Book 1:** Ch. 2, Ch. 6- 7, Ch. 9, Ch. 11	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand need of Alternative Building Materials in Construction Industry and Analyze Embodied Energy, Structural Behavior of Alternative Materials.
CO2	Apply the Knowledge of Engineering Properties on a Variety of Alternative Building Materials and Technologies.
CO3	Evaluate Properties of Mortar and Other Alternative Construction Materials.
CO4	Recommend sustainable materials and technologies for various building components.
CO5	Design methods for Cost Effective Buildings by Adopting Cost Effective Materials and Cost Saving Techniques.

Text Books	
1	"Alternative Building Materials and Technologies", K.S.Jagadish, B.V.Venkatarama Reddy and K.S.Nanjunda Rao, New Age International Private Limited; Second Edition (1 January 2017);ISBN 978-9385923876.

Reference Books	
1	"Building Alternatives for housing. Lecture notes on Alternative Building", K.S . Jagadish, Dept of Civil Engg, Indian Institute of Science ,1997. ISBN-13: 978-9389802726
2	"Ferrocement and Laminated Cementitious Composites", Antoine E. Naaman, Techno Press 3000 (1 January 2000), ISBN-13 : 978-0967493909.
3	"Sustainable Building Technology", K.S. Jagadish, I K International Publishing House Pvt. Ltd (30 March 2019) ISBN-13: 978-9386768209.
4	"Adobe and Rammed Earth Buildings: Design and Construction", Paul Graham McHenry, University of Arizona Press; New edition (15th September 1989), ISBN-10: 0816511241, ISBN-13: 978-0816511242

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=VCdcCn4WF0o
2	https://igbc.in/igbcgreennewbuildings/
3	https://www.youtube.com/watch?v=ODR1eMsLqno
4	https://www.levelset.com/blog/alternatives-to-common-building-materials/

CO – PO MAPPING

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

Semester: IV						
Mechanization in Construction						
Course Code	**:**	BCV406D		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	ETC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Building Materials and Construction Technology
Knowledge on Fundamental Concepts	Basic Civil Engineering ,Material Properties, Construction Methodology etc
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the fundamentals of mechanization and its role in enhancing construction productivity.
CLO2	Learn mechanized aggregate production processes, and quality control as per BIS/ASTM standards.
CLO3	Explore mechanization in modern concrete construction, covering rebar fabrication, formwork, and scaffolding technologies.
CLO4	Gain knowledge of mechanized advanced construction methods such as segmental bridge construction, box pushing, trench-less technology, and pile driving.
CLO5	Gain insights into tunneling and drilling equipment, including their selection, usage, and associated safety measures.

Module – 1	**08 Hrs**
Introduction to Mechanization: Definition, advantages and limitations of mechanization, Indian scenario and Global scenario. Mechanization through construction equipment: Equipment cost, Machine Power, Production cycle - Dozers, scrapers, Excavators, Finishing equipment, Trucks and Hauling equipment, Hoisting equipment, Draglines and Clamshells **Text Book 1:** Ch.2, Ch.6 – 8, Ch.17.	
Module – 2	**08 Hrs**
Mechanization in Aggregate Manufacturing: Natural Aggregates and Recycled Aggregates, Equipment for Aggregate Extraction and Processing, Quarrying Equipment, Drilling Machines, Blasting Techniques, Hydraulic Breakers. Crushing Equipment Jaw Crushers, Cone Crushers, Impact Crushers, Gyratory Crushers, Screening Equipment-Vibrating Screens, Rotary Screens, Scalping Screens, Aggregate Handling and Storage Mechanization - Conveying Systems: Belt Conveyors, Bucket Elevators, Pneumatic Systems, Stockpiling Methods and Equipment, Quality Control and Grading of Aggregates, Mechanized Grading and Sieving, Automated Sampling and Testing, Mechanical Washing and Surface Treatment of Aggregates. BIS/ASTM Standards Related to Aggregate Quality. **Text Book 1:** Ch.13 - 14. **Text Book 2:**Ch.6 -10.	
Module – 3	**08 Hrs**
Mechanization in Modern Concrete Construction: Mechanization in Rebar Fabrication, Mechanization in Concrete Production and Placement Mechanization Through Construction: Formwork and Scaffolding Types, Materials and Design Principles.	

Text Book 1: Ch.16, Ch.21. **Text Book 2:** Ch.11 - 13.	
Module – 4	**08 Hrs**
Mechanization through Construction Methods/Technologies: Segmental Construction of Bridges/Flyovers, Box Pushing Technology for Tunneling, Trench-Less Technology. Pile Driving Equipment: Pile Hammers, Selecting a Pile Hammer, Loss of Energy Due to Impact, Energy Losses Due to Causes Other than Impact. **Text Book 1:** Ch.19**.** **Text Book 2:** Ch.14 -16.	
Module – 5	**08 Hrs**
Drilling, Blasting and Tunneling Equipment: Definition of Terms, Bits, Jackhammers, Drifters, Wagon Drills, Chisel Drills, Piston Drills, Blast Hole Drills, Shot Drills, Diamond Drills, Tunneling Equipment, Selecting the Drilling Method Equipment; Selecting Drilling Pattern. Safety and Environmental Issues in Mechanization **Text Book 1:** Ch.12 - 13, Ch.21. **Text Book 2:** Ch.6, Ch.17 - 18	

Course Outcomes: After completing the course, the students will be able to	
CO1	Illustrate the fundamentals of mechanization and its role in enhancing construction productivity in various project scenarios.
CO2	Analyze mechanized aggregate production processes and ensure quality compliance in accordance with BIS/ASTM standards
CO3	Apply knowledge of mechanized systems for modern concrete construction, in rebar fabrication, and formwork systems to real-life construction scenarios.
CO4	Analyze mechanized methods like pile driving, trenchless technology, and segmental construction for complex infrastructure projects.
CO5	Select appropriate drilling and tunneling equipment and propose safe, efficient solutions considering environmental and safety concerns.

Text Books	
1	"Construction Planning, Equipment", and Methods", R.L. Peurifoy, Clifford J. Schexnayder, Aviad Shapira, and Robert Schmitt, McGraw-Hill Education,8th edition, 2021. ISBN:10- 1260108805.2021.
2	"Construction Equipment and its Planning and Applications", Mahesh Varma, Metropolitan Book Co.(P) Ltd., New Delhi. India, 2nd Edition 1975.

Reference Books	
1	"Construction Equipment and Job Planning",Deodhar, S.V. – Publisher: Anupam Publications ,Khanna Publishers,ISBN-10: 8174091149.
2	"Construction Project Management",Ramesh Gulhati and Subhash C. Sharma Publisher: PHI Learning.
3	"Construction Equipment and Management", Sharma S.C. , Khanna Publishers, Delhi, 1988,ISBN-10: 9382609059.

Web links and Video Lectures (e – Resources)	
1	https://onlinecourses.nptel.ac.in/noc21_ce21/preview
2	https://www.coursera.org/learn/construction-machinery-for-concreting-roads--earth-moving?utm_source=chatgpt.com

3	https://alison.com/course/diploma-in-equipment-management-in-construction?utm_source=chatgpt.com

CO – PO MAPPING

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

Semester: IV					
Universal Human Values (UHV)					
Course Code	**:**	BUH407	**Credits**	**:**	01
Hours/Week(L:T:P)	**:**	1:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	15 L	**SEE**	**:**	50 Marks
Course Type	**:**	UHV	**SEE Duration**	**:**	1 Hour

Course Objectives: This course will enable the students to	
1	Understand the need, purpose, and content of value-based education.
2	Facilitate self-exploration as a process to understand human aspirations and their fulfillment.
3	Understand harmony at various levels – individual, family, society, nature, and existence.
4	Promote ethical competence and awareness of professional ethics.
5	Encourage the adoption of a holistic and humanistic approach in personal and professional life.

Module-1	**03 Hrs**
Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations. **Text Book 1:** Ch.1-2	
Module-2	**03 Hrs**
Harmony in the Human Being Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health. **Text Book 1:** Ch.3	
Module-3	**03 Hrs**
Harmony in the Family and Society Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order. **Text Book1:** Ch.4-5	
Module-4	**03 Hrs**
Harmony in the Nature/Existence Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels and The Holistic Perception of	

Harmony in Existence. **Text Book 1:** Ch.6-7
Module-5 **03 Hrs**
Implications of the Holistic Understanding – a Look at Professional Ethics Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value- based Life and Profession. **Text Book 1:** Ch.8 - 9

Course Outcomes: After completing the course, the students will be able to	
CO1	Describe the need and importance of value education and the process of self-exploration.
CO2	Explain the concept of harmony in the human being, differentiating the needs of the self and the body.
CO3	Apply the principles of trust, respect, and justice to improve relationships within the family and society.
CO4	Analyze and appreciate the interconnectedness and mutual fulfillment among the four orders of nature.
CO5	Demonstrate ethical behavior and decision-making in professional and personal contexts by integrating human values.

Text Books	
1	"The Textbook A Foundation Course in Human Values and Professional Ethics", R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi,2019. ISBN 978-93-87034- 47-1
2	"The Teachers Manual for A Foundation Course in Human Values and Professional Ethics", R R Gaur, R Asthana, G

Reference Books	
1	"Jeevan Vidya": Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999
2	"Human Values", A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3	"The Story of Stuff", Annie Leonard, 2011,ISBN:101451610297
4	"The Story of My Experiments with Truth". Mohandas Karamchand Gandhi, Fingerprint! Publishing,2009,
5	"Small is Beautiful" - E. F Schumacher,RHUK, ISBN:978-0099225614
6	"Slow is Beautiful-" - Cecile Andrews, New Society Publisher.2006

7	"Economy of Permanence "- J C Kumarappa, Sarva Seva Sangh Prakashan, 2017
8	"Bharat Mein Angreji Raj" Pandit Sunderlal, Prabhat Prakashan 2018
9	"Rediscovering India" Dharampal, Stosius Inc/Advent Books Division (1 December 1983), ISBN-10 : 0706922778
10	"Hind Swaraj or Indian Home Rule" Mohandas K. Gandhi, ISBN-13 : 978-1449922214.
11	"India Wins Freedom" Maulana Abdul Kalam Azad, Orient BlackSwan,1989, ISBN: 978-8125044826
12	"Vivekananda" Romain Rolland (English), Advaita Ashrama, India,2010.
13	"Gandhi" Romain Rolland (English), Srishti Publishers and Distributors,2002.
14	"How the Other Half Dies" Sussan George, Penguin Press. 1991.
15	"Limits to Growth – Club of Rome's report", Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, , Universe Books.
16	"Jeevan Vidya Ek Parichay" A Nagraj, 1998, , Divya Path Sansthan, Amarkantak.
17	"Science and Humanism",P L Dhar, RR Gaur, 1990, Commonwealth Publishers.
18	"Human Values", A N Tripathy, 2003, New Age International Publishers.
19	"How to practice Natural Farming" SubhasPalekar, 2000, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
20	"Fundamentals of Ethics for Scientists and Engineers" ,E G Seebauer and Robert L. Berry, 2000, Oxford University Press
21	"Engineering Ethics (including Human Values",M Govindrajran, S Natrajan and V.S. Senthil Kumar, Eastern Economy Edition, Prentice Hall of India Ltd.
22	Foundations of Ethics and Management, B P Banerjee, 2005, Excel Books.
23	"Indian Ethos and Modern Management", B L Bajpai, 2004, New Royal Book Co., Lucknow. Reprinted 2008.

Web links and Video Lectures (e – Resources)	
1	Value Education websites,
2	https://www.uhv.org.in/uhv-ii,
3	http://uhv.ac.in,
4	http://www.uptu.ac.in
5	http://www.storyofstuff.com
6	https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
7	https://fdp-si.aicte-india.org/8dayUHV_download.php
8	https://www.youtube.com/watch?v=8ovkLRYXIjE
9	https://www.youtube.com/watch?v=OgdNx0X923I
10	https://www.youtube.com/watch?v=nGRcbRpvGoU

11	https://www.youtube.com/watch?v=sDxGXOgYEKM

CO – PO MAPPING

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

Semester: IV						
Digital Land Surveying and Mapping (DLS and M)						
Course Code	**:**	BCV408A		**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	Basics of Physics and Mathematics
Knowledge on Fundamental Concepts	Basic Surveying
Knowledge on Connected Tools (If any)	Familiarity with use of computer

Course Objectives: This course will enable the students to	
CLO1	Understand and select appropriate land-surveying methods by mastering their purpose, applications, and principles.
CLO2	Apply GPS technology in surveying by comprehending its architecture, signals, and control-point methods.
CLO3	Employ Total Stations by mastering components, setup, measurements, and error reduction techniques.
CLO4	Interpret contour representations by understanding fundamentals, intervals, plotting, and automated techniques.
CL05	Produce and manage digital maps by mastering mapping principles, software, and digital workflows.

Module – 1	**03 Hrs**
Fundamentals of Land Surveying: Introduction, Need, Applications, Types, Fundamentals and Operations. **Text Book 1:** Ch. 1	
Module – 2	**03 Hrs**
Global Positioning System (GPS): Introduction, GPS Architecture: Space Segment, Control Segment and User Segment, GPS Signal, Navigational Data, GPS Positioning of Control Point. **Text Book 2 :** Ch. 2	
Module – 3	**03 Hrs**
Total Station (TS): Introduction, Components, Types, Parts and Accessories of TS, Handling and Setting of TS, Measurement of Distance and Angle, Errors in TS. **Text Book 1 :** Ch.12	
Module – 4	**03 Hrs**
Contouring: Introduction, Vertical Representation: Fundamentals, Contour Interval, Characteristics, Contour Plotting, Automated Contouring. **Text Book 1 :** Ch. 5	
Module – 5	**03 Hrs**

Digital Mapping (DM) and Digital Data Manipulation (DDM): Mapping Fundamentals and Considerations, Mapping Software, Automated Mapping, Working Steps. **Text Book 1 :** Ch.14

Course Outcomes: After completing the course, the students will be able to	
CO1	Summarize land surveying purposes, types, and basic field operations for civil projects.
CO2	Compute control-point positions using GPS architecture, signals, and navigational data.
CO3	Utilize Total Station to measure distances and angles, recognize components, and assess errors.
CO4	Interpret contour maps using appropriate intervals and plotting methods.
CO5	Build digital maps using software and automated workflows, and use drone data for mapping.

Text Books	
1	Elements of Engineering Survey (2016) by Jayanta Kumar Ghosh, CreateSpace Independent Publishing Platform, ISBN-101523325607:

Reference Books	
1	Surveying for Engineers (2006), 3rd Edition by J. Uren and W.F.Price, ISBN 978-0-333-57705-9
2	GPS Control Point Positioning. Ghosh, J.K. and Ch. V.A. Rao, (Asian GPS Conference held at New Delhi (October 29-30, 2001), pp 43-46.
3	A Text Book on GPS Surveying by Jayanta Kumar Ghosh, Createspace Independent Publishing Platform, ISBN-10 1522952748:
4	Elementary Surveying – An introduction to Geomatics (2012) By C.D. Ghilani and P.R. Wolf, ISBN-10 : 013615431X

Web links and Video Lectures (e – Resources)	
1	https://onlinecourses.nptel.ac.in/noc23_ce05/unit?unit=17&lesson=18

CO – PO MAPPING

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

Semester: IV						
Introduction to Building Information Modelling						
Course Code	:	BCV408B		**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	**Auto CAD**
Knowledge on Fundamental Concepts	Basic knowledge about isometric structures and Engineering Graphics fundamentals are preferred
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the Foundations of BIM.
CLO2	Familiarize with BIM Tools and Workflow.
CLO3	Explore Real-World Applications and Future Trends.
CLO4	Explain the Process of Creating the BIM Model
CLO5	Comprehend the Various Emerging Trends of BIM.

Module – 1	**03 Hrs**
Introduction to BIM: Defines BIM, Its History and Its Role in the AEC (Architecture, Engineering and Construction) Industry, Introduction Upto 7D, Services Conflict Management. **BIM Software Fundamentals:** Introduces Common BIM Software Like Autodesk Revit, With A Focus On Basic Modelling, Navigation and Interface.	
Module – 2	**03 Hrs**
Bim Software Tools: • Overview of Popular BIM Software Platforms (E.G., Revit, AutoCAD Civil 3D) • Basic Navigation Between Different Roles • Understanding The Role of BIM Software in Project Lifecycle. **3DModeling Techniques:** Covers Creating 3D Models, Including Elements Like Walls, Floors, Roofs and Windows, Along with Basic Drafting and Dimensioning. **Visualization and Documentation:** Explores Different Visualization Modes, Creating Various Views (Plans, Elevations, Sections) and Generating Documentation Like Sheets and Schedules.	
Module – 3	**03 Hrs**
BIM Workflow and Collaboration: • Understanding The BIM Workflow Process • Role of BIM in Project Planning, Design, Construction and Maintenance • Collaborative Aspects of BIM in Interdisciplinary Project Teams **BIM in Construction Planning and 4D Simulation:** Introduces the use of BIM for Construction Scheduling, 4D Simulation (Linking the 3D Model with Project Timeline) and Cost Estimating. **BIM Standards and Protocols:** Familiarizes Students with Industry Standards and Protocols, Like ISO 19650.	
Module – 4	**03 Hrs**
Data Management and Integration: • Managing and Integrating Various Data Types Within A BIM Environment	

• Understanding Data Exchange Formats (Eg. IFC) • Importance of Data Management in BIM Projects.	
Module – 5	**03 Hrs**
Real-world Applications and Future Trends: Case studies and examples of BIM implementation in civil engineering projects • Future trends and advancements in BIM technology • Ethical considerations and challenges in BIM implementation. **BIM for Infrastructure:** Expands the application of BIM to infrastructure projects, including roads, bridges, and other civil engineering structures.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate understandings of BIM Fundamentals.
CO2	Utilize BIM Software Tools Effectively.
CO3	Analyze Real-world Applications and Future Trends.
CO4	Apply the procedures of submission of drawings and Develop working and submission drawings for building.
CO5	Apply BIM for case studies.

Text Books	
1	"BIM Handbook", Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston. ISBN-13. 978-0470185285.
2	"ISO 19650 - Building Information Modelling (BIM)",2018. International Organization for Standardization.2018.

Reference Books	
1	"BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors" by Chuck Eastman, Paul Teicholz, Rafael Sacks, and Kathleen Liston. ISBN-100470185287
2	"BIM for Construction Health and Safety" by Stefan Mordue and Roland Finch.NBS Publisher,2014. ISBN-101859465285
3	"Building Information Modeling: Framework for Structural Design" by Nawari O. Nawari,CRC Press,IABN:10 1482240432

Web links and Video Lectures (e – Resources)	
1	Coursera: "Building Information Modeling (BIM) Fundamentals" by Autodesk.
2	LinkedIn Learning: "BIM: Essential Training" by Eric Wing
3	Autodesk BIM 360 Blog: Offers insights, tips, and best practices on BIM implementation.

CO – PO MAPPING

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

Semester: IV						
Construction Skill Laboratory						
Course Code	:	BCV408C		**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 Hour

Prerequisites:	
Courses	Basic Construction Materials.
Knowledge on Fundamental Concepts	Building Planning and Drawing
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the basic construction tools, materials, and site safety protocols.
CLO2	Develop hands-on skills in essential construction activities such as masonry, concreting, formwork, and reinforcement.
CLO3	Interpret technical drawings and bar bending schedules for field implementation.
CLO4	Perform basic quality control tests on construction materials.
CLO5	Identify tools, materials, and safety practices associated with plastering work.

Experiments **12 Lab Sessions**
1. Introduction to Real Time Construction Practices: 2. Setting out construction site layout (Using Total station/ Auto level) 3. Preparing mortar mix (cement-sand ratio). 4. Practicing different brick bonds: stretcher bond, header bond, English bond. 5. Concrete batching, mixing (manual and machine), placing, and compacting (using vibrator). 6. Formwork installation for columns (including column starters), beams, and slabs. 7. Concrete pour card: Filling up and approval 8. Concrete cube for QA/QC 9. Planning Bar cutting length, bar cutting (to be done by a trained worker not students), bending, and tying practices. 10. Understanding overlaps, hooks, anchorage lengths, chairs. 11. Preparation of stirrups and tying of reinforcement column/beam cages. 12. Hands on exposure to Plastering, flooring (tiles/IPS), and painting practices.

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate practical skills in bricklaying, plastering, and concrete work.
CO2	Interpret bar bending schedules and execute reinforcement work.
CO3	Apply formwork and concreting techniques with proper compaction and curing.
CO4	Conduct basic field and laboratory quality tests for construction materials
CO5	Exhibit teamwork, time management, and adherence to construction site ethics

Text Books	
1	Construction Technology (Vol. I and II), Chudley and R. Greeno, Pearson Education, ISBN: 978-0435046828
2	A Manual of Civil Engineering Practical Work, S. Ramamrutham, Dhanpat Rai Publishing, ISBN: ISBN-10. 9384378127

Reference Books	
1	Construction Planning, Equipment, and Methods, R.L. Peurifoy, Clifford J. Schexnayder, McGraw-Hill. 2010. ISBN-10. 9780070706996
2	Construction Management and Planning, B. Sengupta and H. Guha, Tata McGraw-Hill.1995. ISBN-13. 978-0074623985

Web links and Video Lectures (e – Resources)	
1	Practicing different brick bonds: stretcher bond, header bond, English bond: https://youtu.be/lOHEvZ_UOVs?feature=shared
2	How To Prepare Bar Bending Schedule For Reinforcements in Concrete Beams and Columns: **https://youtu.be/lV4zP3JKi4Q?feature=shared**
3	What Is Finishing Work In Construction: **https://youtu.be/TXFKp4bLEiI?feature=shared**

CO – PO MAPPING

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

Semester: IV						
3DS Max, Sketch Up and Revit Architecture						
Course Code	:	BCV408D		**Credits**	:	1
Hours/Week(L:T:P)	:	0:0:2		**CIE**	:	50 Marks
Total Hours	:	14 P		**SEE**	:	50 Marks
Course Type	:	SEC		**SEE Duration**	:	2 Hour

Prerequisites:	
Courses	Building Planning and drawing
Knowledge on Fundamental Concepts	Components of Building
Knowledge on Connected Tools (If any)	AutoCAD

Course Learning Objectives: This course will enable the students to	
CLO1	Understand how to prepare 3D drawings using 3ds Max.
CLO2	Acquire knowledge on creating animation and rendering the objects using 3ds Max.
CLO3	Knowing the applications of google SketchUp for building modelling.
CLO4	Demonstrate proficiency in the Revit user interface and navigation tools to create and manage building information models.
CLO5	Create the workflow followed in industry during creation of BIM 3D model.

Experiments **14 Lab Sessions**
1. Introduction to 3Ds Max Objects, Creating Shapes with Splines, Editing Meshes and Creating Complex Objects.
2. 3ds Max - Importing AutoCAD Plans into 3ds Max, Creating AEC Objects, Light and Shadow.
3. Using the 3ds Max Camera, Creating Animations.
4. 3ds Max - Rendering, Applications of 3DS Max.
5. SketchUp: Introduction, drawing tools, 3D Modeling Basics, Precision Modeling, Textures, Materials, and Colors.
6. Enhancing Visual Appeal with 3D Styles, applications of google sketch up.
7. Revit Architecture: Introduction to BIM, Project Templates, Revit File Types Working with Revit Elements and Families.
8. Revit Architecture: Exploring the User Interface Starting a Project, Modelling wall, door and windows, floors, staircase, roofs.
9. Revit Architecture: Clash Check – Types, Clash avoidance process, Clash Detection Process, Clash Detection Priority Matrix and Report generation.
10. Revit Architecture: Clash Detection Rules, Report, Grouping, Clash Detection Process – Demo.

Course Outcomes: After completing the course, the students will be able to	
CO1	Prepare, Read and Interpret the Drawings in a Professional Set Up.
CO2	Acquire skills to create animations and render objects effectively using 3Ds Max.
CO3	Recognize the applications and functionalities of Google SketchUp for building modeling.
CO4	Demonstrate proficiency in navigating and using Revit software to create and manage Building Information Models (BIM).
CO5	Explain and apply the typical industry workflow involved in the creation of BIM 3D models.

Text Books	
1	"Architectural Design with Sketchup", Alexander C Schreyer, 3rd edition. ISBN: 1394161131
2	"BIM Handbook", Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston. ISBN: 978-0470541371

Reference Books	
1	"ISO 19650 Standard for Industrial Asset: A Comprehensive Guide to the Five Parts of BIM".
2	"Autodesk - Revit 2021 Architecture Fundamentals" , SDC publications. ISBN: 978-1-63057-335-5
3	"Autodesk 3Ds Max 2026 Basics Guide" Kelly L. Murdock - – SDC publications. , ISBN: 978-1-63057-746-9

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/@Autodesk3dsMax
2	https://www.youtube.com/results?search_query=sketch+up
3	https://www.youtube.com/playlist?list=PLTscI_CLWNfAVpcjPEMlkxJhwsL0mjDU2

CO – PO MAPPING

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

Semester: IV						
Metaphysical Science						
Course Code	**:**	BMP409		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	1:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	15 L		**SEE**	**:**	50 Marks
Course Type	**:**	HSSMC		**SEE Duration**	**:**	1 Hour

Course Learning Objectives: This course will enable the students to	
CLO1	Explore the philosophical and spiritual aspects of the universe.
CLO2	Compare and contrast ontological and Epistemology theories.
CLO3	Analyze metaphysical perspectives on time, space, and the origin of the universe.
CLO4	Inculcate the Metaphysical inquiries into the nature of mind and consciousness.
CLO5	Apply and analyze the nature of reality, existence, and universe beyond the physical sciences.

Module 1	**03 Hrs**
Introduction to Metaphysics: Definition of Metaphysics, scope, and historical roots (Aristotle, Plato, Kant). Distinction between metaphysics, physics and spirituality. **Branches of Metaphysics:** Ontology, cosmology, epistemology, and **Key Metaphysical Questions:** Why is there something rather than nothing? The nature of abstract entities (numbers, moral values). **Text Book 2:** Ch.1 - 2	
Module 2	**03 Hrs**
Ontology and Epistemology **Ontology (Study of Being):** Materialism vs. Idealism vs. Dualism, The Problem of Universals (Realism vs. Nominalism). Epistemology (Study of Knowledge): Rationalism (Descartes) vs. Empiricism (Locke, Hume). Theories of truth (Correspondence, Coherence, Pragmatic). **Skepticism and Constructivism:** Can we truly know reality? (Descartes' Evil Demon, Simulation Theory). **Text Book 2:** Ch.3 – 5	
Module 3	**03 Hrs**
Cosmology – Metaphysical Perspectives on the Universe: Philosophical cosmology vs. physical cosmology, Metaphysical views on time, space, and the origin of the universe, The Anthropic Principle and Fine-Tuning debate, Creation, causality, and the infinite regress problem, Multiverse theory and its metaphysical implications, Spiritual and ancient cosmologies: Vedic, Taoist, and Indigenous models. **Text Book 1:** Ch.1 **Text Book 2:** Ch.6-7	
Module 4	**03 Hrs**

Mind and Consciousness: Definition of mind and consciousness, Mind-body problem: Dualism vs. Physicalism, Theories of consciousness: Integrated Information Theory (IIT), Global Workspace, Panpsychism, Eastern and Western views of the self and mind; Artificial intelligence and machine consciousness, Role of consciousness in observation and decision- making. **Text Book 1:** Ch.2 **Text Book 2:** Ch.8	
Module 5	**03 Hrs**
Quantum Healing and Energy Medicine: Basics of quantum mechanics (superposition, entanglement, observer effect), Quantum theory and the mind: Role of consciousness in quantum collapse, Overview of Quantum Healing – Deepak Chopra's model, Energy fields: Biofield theory, chakras, subtle energy systems, Placebo effect, intention and non-local healing, Implications for engineering bio-resonant technologies. **Text Book 1:** Ch.3-15	

Course Outcomes: After completing the course, the students will be able to	
CO1	Assess the nature of reality, existence and the universe.
CO2	Evaluate the competing ontology and epistemological frameworks.
CO3	Interpret the various multiverse models and their philosophical significance.
CO4	Analyze the mind-body problem and theories of consciousness.
CO5	Differentiate the theoretical and practical intersections between quantum physics, quantum healing and meditation.

Text Books	
1	"Quantum Metaphysics", Tarja Kallio-Tamminen, Otamedia, Oy 2004. ISBN: 952-10-1927-1
2	"Metaphysics-A Very Short Introduction", Stephen Mumford, Sl. No. 20129780191640261, 0191640263, OUP Oxford, 2012

Reference Books	
1	"Quantum Healing (Revised and Updated): Exploring the Frontiers of Mind/Body Medicine", Deepak Chopra M.D., 2015.
2	"Quantum Body: The New Science of Living a Longer, Healthier, More Vital Life", Deepak Chopra M.D., 2023.

Weblinks	
1	https://www.yogajournal.com/meditation/
2	https://youtube.com/shorts/JgCVh6wwgNg?si=R87-PGIrUSII774w
3	https://www.youtube.com/watch?v=XvyuUqlX7fE
4	https://core.ac.uk/download/pdf/14914967.pdf

5	https://www.youtube.com/watch?v=_ba0yIAZ9ok
6	https://www.youtube.com/watch?app=desktop&v=fzxohf49loU
7	https://www.youtube.com/watch?v=SSGKowtXS3Y
8	https://www.youtube.com/watch?v=r_piRatnFlY

CO – PO Mapping

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

Semester: IV						
National Service Scheme (NSS)						
Course Code	:	BNS410		**Credits**	:	0
Hours/Week(L:T:P)	:	0:0:2		**CIE**	:	100 Marks
Total Hours	:	24 L		**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.
CL05	Appraise the importance of ethical issues and team working abilities pertaining to the social services.

Activity– 1	**08 Hrs**
Water conservation techniques – Role of different stakeholders– Implementation.	
Activity – 2	**08 Hrs**
Preparing an actionable business proposal for enhancing the village income and approach for implementation.	
Activity – 3	**08 Hrs**
Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.	

Pedagogy – Guidelines, it may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution

Sl.	**Topic**	**Group Size**	**Location**	**Activity Execution**	**Reporting**	**Evaluation of the Topic**
1	Water conservation techniques – Role of different stakeholders– Implementation.	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

2	Preparing an actionable business proposal for enhancing the village income and approach for implementation.	May be individual or team	Villages/ City Areas/ Grama panchayat/ public associations /Government Schemes officers/ 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
3	Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.	May be individual or team	Local government /private/ aided schools/Government Schemes officers/ etc.....	School selection/pro per consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

Plan of Action (Execution of Activities for 4th 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 4th 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 4th 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 each 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					3
CO2						3					3
CO3						3					3
CO4						3					3
CO5						2	3	3			3

Semester: IV						
Physical Education (PE) (Sports and Athletics)						
Course Code	**:**	BPE410		**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 an understanding of ethical principles and moral values and their importance in sportsmanship, fair play, and personal conduct in games and athletic activities.
CLO2	Acquire practical skills and demonstrate technical proficiency in selected sports or athletic events through structured physical training and performance.
CLO3	Understand the role of effective organization, administration, and management in the successful conduct of sports events and athletic programs.

Module – 1	**4 Hrs**
Ethics and Moral Values A. Ethics in Sports B. Moral Values in Sports and Games	
Module – 2	**16 Hrs**
Specific Games (Any one to be selected by the student) A. Volleyball – Attack, Block, Service, Upper Hand Pass and Lower Hand Pass. B. Athletics (Track Events) – Any event as per availability of Ground	
Module-3	**4 Hrs**
Role of Organization and administration	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the principles of ethics and moral values and their application in sports and games.
CO2	Demonstrate fundamental skills, techniques and rules of the selected game or athletic event.
CO3	Apply sportsmanship, fairness and respect for rules during practice and competition.
CO4	Analyze the role of organization and administration in conducting sports events effectively.
CO5	Develop teamwork, leadership and decision-making skills through participation in sports 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	2						3	3			
CO2	3		2		2		1	2	3		
CO3	2		1				3	3	2		
CO4	2	2				2		2	3		2
CO5	1	2							3		2

Semester: IV						
Yoga						
Course Code	:	BYO410		**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	Describe patanjali's ashtanga yoga and its role in holistic well-being.
CLO2	Perform the suryanamaskar sequence with correct breathing and posture.
CLO3	Identify different types of asanas with their techniques and benefits.
CLO4	Utilize the knowledge of kapalabhati with proper technique and safety measures.
CLO5	Apply pranayama techniques to enhance physical and mental health.

Module - 1	**02 Hrs**
Patanjali's Ashtanga Yoga: Introduction, its need and importance, Eight limbs of Yoga – overview, **Yama:** Ahimsa, Satya, Asteya, Brahmacharya, Aparigraha **Niyama:** Shoucha, Santosha, Tapa, Svaadhyaya, Eshvarapranidhana **Text Book 1:** Ch.1 (Part 1).	
Module - 2	**02 Hrs**
Surya Namaskar: Concept and significance of Surya Namaskar, 12-step Surya Namaskar sequence, Practice - 4 rounds of Surya Namaskar, Breathing coordination and posture alignment. **Text Book 1:** Ch.2 (Part 2**).**	
Module - 3	**03 Hrs**
Asanas: Meaning of Asana, Need and importance of practicing Asanas, Classification of Asanas, Sitting Asanas - Sukhasana, Paschimottanasana, Standing Asanas - Ardhakati Chakrasana, Parshva Chakrasana, Prone Line Asana - Dhanurasana, Supine Line Asanas - Halasana, Karna Peedasana, For each Asana - Meaning by name, Technique of performing, Precautionary measures, Benefits. **Text Book 1:** Ch.2 (Part 2).	
Module - 4	**02 Hrs**
Kriyas: Introduction to Shatkarmas (Cleansing practices), Meaning and importance of Kapalabhati, Technique of Kapalabhati (40 strokes/min, 3 rounds), Precautionary measures and benefits. **Text Book 1:** Ch.3 (Part 3).	
Module - 5	**03 Hrs**

Pranayama: Meaning, need, and importance of Pranayama, Types of Pranayama and their benefits, for each type - Meaning by name, Technique, Precautionary measures, Benefits, Types included – Suryanuloma-Viloma, Chandranuloma– Viloma, Suryabhedana, Chandra Bhedana, Nadishodhana. **Text Book 1:** Ch. 3 (Part 3)

Course Outcomes: After completing the course, the students will be able to	
CO1	Summarize patanjali's ashtanga Yoga and its significance in promoting daily well-being.
CO2	Demonstrate surya namaskar with correct sequence, breathing and posture alignment.
CO3	Classify various types of asanas with their benefits and precautions.
CO4	Utilize the knowledge to practice kapalabhati with correct technique, breathing rhythm and safety guidelines.
CO5	Apply pranayama to improve overall physical fitness and mental wellness.

Text Book	
1	"The Illustrates Light on Yoga",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" Ajitkumar
4	"Yoga for Children –step by step",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	3	2		2
CO3						2	2	3	2		2
CO4						2	2	3	2		2
CO5						2	2	3	2		2

Semester: I V					
Music					
Course Code	:	BMU410	**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 Melasystems.
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 Book1: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.1995.
2	"A Textbook of Carnatic Music", Dr. S. Bhagyalekshmy, CBH Publications, ISBN:13. 978-8185381121
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		1		1	1	1		1

Semester: IV						
Competency Enhancement Course-2						
Course Code	**:**	BCE411		**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	Competency Enhancement Course-1
Knowledge on Fundamental Concepts	Arithmetic operations, fractions, decimals and elementary algebra. comprehension of basic English
Knowledge on Connected Tools (If any)	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Enhance Quantitative Problem-Solving Skills
CLO2	Master Data Interpretation and Visual Analysis
CLO3	Strengthen Logical Reasoning and Spatial Intelligence
CLO4	Develop Advanced Verbal Aptitude and Communication Accuracy
CLO5	Sharpen Critical Thinking through Assumptions and Analytical Judgement

Module - 1	**08 Hrs**
Partnership: Definition of Partnership, Types of Partnerships (Simple and Compound), Calculation of Profit Sharing Ratio, Capital and Time of Investment, Working and Sleeping Partners, Admission and Retirement of Partners, Distribution of Profits and Losses, Partnership Formulas, Complex Partnership Problems. **Time and Work:**Definition and Concept of Time and Work, Relation between Work, Time, and Efficiency, Calculation of Individual and Combined Work, Work Rate and Work Done in a Given Time, Efficiency Comparison of Different Workers, Time Taken by Individuals or Groups, Alternate Work and Negative Work (Destructive Work), M:W:D Rule (Men:Work:Days Problems), Work Equivalence Formula, Problems Involving Wages Based on Work, Pipes and Cisterns (Work with Inlets and Outlets), Successive Work Distribution, Complex Time and Work Questions **Coding and Decoding:** Letter Coding, Number Coding, Symbol Coding, Mixed Letter-Number Coding, Substitution Coding, Decipher Coding, Direct Coding-Decoding, Conditional Coding, Message Coding, Operations-Based Coding-Decoding, and Complex Coding-Decoding Problem **Analogy:** Number Analogy, Alphabet Analogy (using letter sequences or codes), Symbol Analogy, Figure/Pattern Analogy, Geometrical Shapes Analogy, Matrix-Based Analogy, Series- Based Numeric Analogy, Mirror and Water Image Analogy, Classification-Based Figure Analogy, Embedded Figure Analogy, Complex Numerical and Visual Analogy Problems. **Text Book1:**Ch.36	
Module - 2	**08 Hrs**

Time, Speed and Distance: Definition and Relationship of Time, Speed, and Distance, Units and Conversion of Speed and Distance, Average Speed, Relative Speed, Problems on Trains, Problems on Boats and Streams, Upstream and Downstream Concepts, Races and Games, Time to Meet/Opposite Direction Problems, Circular Tracks, Shortcut Tricks and Application- Based Problems.

Trains, Boats and Streams, Races: Trains: Problems on Trains, Time Taken to Cross a Stationary Object, Time Taken to Cross Another Moving Train, Relative Speed in Same and Opposite Direction, Length of Train and Platform Calculations, Speed and Time Conversions, Overtaking and Passing Scenarios, Shortcut Tricks for Train Problems.

Boats and Streams: Upstream and Downstream Concepts, Speed of Boat in Still Water, Speed of Stream, Calculation of Effective Speed (Upstream and Downstream), Time and Distance in Streams, Problems on Boats Overtaking/Meeting, Relative Speed in Water, Application-Based Boat and Stream Questions.

Races: Types of Races (Straight, Circular, Relay), Start Types (Head Start, Dead Heat), Calculating Winner and Margin, Calculation of Lead or Lag, Relative Speed in Races, Time Calculations to Meet or Overtake, Race Completion Time, Use of Ratio and Proportion in Races, Application-Based Race Problems.

Seating Arrangement: Linear Arrangement, Circular Arrangement, Square/Rectangular Arrangement, Single- Row and Double-Row Arrangements, Facing Inside and Outside Arrangements, Arrangement Based on Directions (Left/Right/Clockwise/Counterclockwise), Seating Based on Conditions or Constraints, Position and Order Determination, Seating with Blood Relations or Attributes, Arrangement with Vacant Seats.

Data Arrangement: Linear Data Arrangement, Circular Data Arrangement, Matrix/Table-Based Data Arrangement, Parallel/Double Row Arrangement, Attributes/Property-Based Arrangement (with multiple characteristics), Sequencing and Ranking Arrangement, Floor/Building Arrangement, Conditional Arrangement (with Direct and Indirect Clues), Application of Consolidated Table and Matrix Methods.

Text Book 1: Ch.14-18

Module - 3	**08 Hrs**

Permutation and Combination

Understanding the difference between the permutation and combination, Rules of Counting-rule of addition, rule of multiplication, factorial function, Concept of step arrangement, Permutation of things when some of them are identical, Concept of 2n, Arrangement in a circle.

Probability

Single event probability, multi event probability, independent events and dependent events, mutually exclusive events, non-mutually exclusive events, combination method for finding the outcomes.

Clocks and Calendars

Clocks: Calculation of Angle Between Hands (Hour, Minute, Second), Time Gains and Losses by Clocks, Number of Times Hands Coincide or Oppose, Incorrect/Slow/Fast Clocks, Mirror and Water Image Questions on Clocks, Alarm and Time Calculation.Problems, Calculation of Overlapping/Adjacent Hands, Problems on Clock Striking. Calendars: Odd Days Concept, Leap Year and Ordinary Year Calculation, Counting Odd Days in Multiple Years, Day of the Week Calculation for a Given Date, Calendar Repetition, Month and Year Code Methods, Finding Dates with

Same Day, Calculation of Future/Past Day from a Given Day, Number of Sundays/Saturdays/Specific Weekdays in a Period, Day-Difference Problems.

Text Book 1: Ch.6-9, Ch.13-16

Module - 4	**08 Hrs**

Data Interpretation

Tables, Bar Graphs, Line Graphs, Pie Charts, Caselets (Paragraph-based Data Sets), Radar Charts, Mixed or Combination Graphs (Multiple Data Forms Together), Data Comparison and Analysis, Calculation-Based Data Interpretation, Ratio and Percentage Interpretation, Data Sufficiency in Data Interpretation.

Ages

Present age and future age calculations, past age calculations, age problems in ratios, age difference problems, multiple or submultiple age relations, product of ages problems, age problems involving sum of ages, age relationships in family contexts, age-based word problems with equation formulation, and age problems involving time intervals such as years ago or years hence.

Crypt arithmetic

Basic concepts, addition, subtraction, multiplication of coded alphabets, Types of cryptarithm.

Syllogisms

Basic Concepts of Syllogism, Types of Statements (A, E, I, O), Venn Diagram Representation, Rules of Syllogism, Direct and Indirect Syllogism Questions, Condition-based Syllogism, Coded Syllogism, Double/Triple Syllogism Problems, Syllogism with Quantifiers, Syllogism in Data Interpretation, and Conclusions Drawing from Statements.

Text Book1: Ch.28 - 29

Module - 5	**08 Hrs**

Mensuration

Basic Geometrical Figures, Perimeter and Area of Plane Figures (Square, Rectangle, Triangle, Parallelogram, Rhombus, Trapezium), Area and Circumference of Circle, Area of Sector and Segment of a Circle, Surface Area and Volume of Cuboid, Surface Area and Volume of Cube, Surface Area and Volume of Cylinder, Surface Area and Volume of Cone, Surface Area and Volume of Sphere and Hemisphere, Frustum of a Cone, Conversion between Units of Measurement, Application-Based Problems on Mensuration.

Data sufficiency

Statement Evaluation, Identifying Sufficient and Insufficient Statements, Dealing with Irrelevant Information, Definite vs. Indefinite Information, Elimination Method, Data Sufficiency on Blood Relations, Data Sufficiency on Order and Ranking, Data Sufficiency on Direction and Distance, Data Sufficiency on Coding-Decoding, Data Sufficiency on Seating Arrangement, Data Sufficiency on Puzzles, Data Sufficiency on Syllogism, Data Sufficiency on Alphanumeric Series.

Visual Reasoning and Cubes

Visual Reasoning: Figure/Image Series Completion, Odd-One-Out (Visual Discrimination), Mirror Images, Water Images, Embedded Figures, Paper Folding and Cutting, Analytical Puzzles with Patterns, Figure Counting, Pattern Completion, Analogy in Figures, Classification of Visual Data, Venn Diagrams, Direction and Distance with Visuals.

Cubes: Basic Properties of Cubes (Faces, Vertices, Edges), Cube and Dice Basics, Counting of Smaller Cubes, Painted Cube Problems (Counting

Cubes with 0/1/2/3 Painted Faces), Cube Cutting and Partitioning, Dice (Number/Colour/Letter Arrangements), Unfolded (Net) Cube to Folded Cube Problems, Opposite and Adjacent Faces of Dice, Identification of Hidden Surfaces, Face Rotation and Positioning, Shortcuts and Tricks for Cubes and Dice Problems

Para Jumbles and Cloze Test

Sentence Jumble/Ordering, Identification of Opening/Closing Sentences, Logical Sequencing and Linking, Transitional Words and Connectors, Theme Identification in Jumbled Passages, Cloze Test with Contextual Blanks, Vocabulary and Grammar- based Blanks, Contextual Inference for Blank Filling, Error Detection in Cloze Test.

Reading Comprehension

Main Idea Identification, Factual/Inference-based Questions, Tone and Attitude Analysis, Vocabulary in Context, Passage Summarization, Structure and Organization of Passage, Logical Completion of Paragraphs, Supporting/Contradicting Evidence, Eliminating Irrelevant Information, Comparative Comprehension Passages.

Critical Reasoning

Assumption-Based Questions, Strengthen/Weaken the Argument, Inference Drawing, Conclusion Identification, Evaluating Arguments and Evidence, Identifying Flaws in Reasoning, Paradox/Discrepancy Resolution, Cause-and-Effect Reasoning, Analogy and Parallel Reasoning, Application of Logical Principles.

Text Book 1: Ch.22-25,

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply arithmetic and logical reasoning to solve problems.
CO2	Develop spatial and logical skills to solve cube, dice, puzzle and seating arrangement questions.
CO3	Develop reading, vocabulary and grammar through para jumbles, sentence completion and idioms.
CO4	Enhance verbal reasoning by solving analogies, rearranging sentences and identifying assumptions and conclusions.
CO5	Apply combinatorics and probability to solve permutation, combination and crypt arithmetic problems.

Text Books	
1	"Quantitative Aptitude for Competitive Examinations", R.S. Aggarwal Chand Publishing. – 2023.ISBN:10-9352534026.
2	"Word Power Made Easy", Norman Lewis, Published by PENGUIN INDIA – 2015, ISBN:978-0143424680.
3	"How to Prepare for Quantitative Aptitude for the CAT", Arun Sharma 6th Edition, McGraw-Hill Education,2014,.ISBN- 978-9339205126.

Reference Books	
1	"Puzzle Test and Seating Arrangements", K. Kundan,1st Edition,BSC Publishing Company Pvt Ltd. 2023, ISBN: 9789394666023.
2	"A Modern Approach to Verbal and Non-Verbal Reasoning", R.S. Aggarwal,2025-26 Edition, S. Chand Publishing,2024, ISBN: 978-9352832163.

Web links and Video Lectures (e – Resources)	
1	https://youtu.be/KWZ0lR8cCwc
2	https://youtu.be/mBtBD1N7ywQ
3	https://youtu.be/B9MhxmcwnpQ
4	https://youtu.be/VaEbefWFIlc
5	https://youtu.be/3AL_6EQmnkY

CO – PO MAPPING

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

Institute Vision

Preparing Competent Engineering and Management Professionals to Serve the Society

Institute Mission

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

Department Vision

Building Competent Civil Engineers with a Societal Perspective

Department Mission

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

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

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