RNS TRUST ®

RNS INSTITUTE OF TECHNOLOGY

Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi
Approved By AICTE, New Delhi. Accredited by NAAC 'A+' Grade
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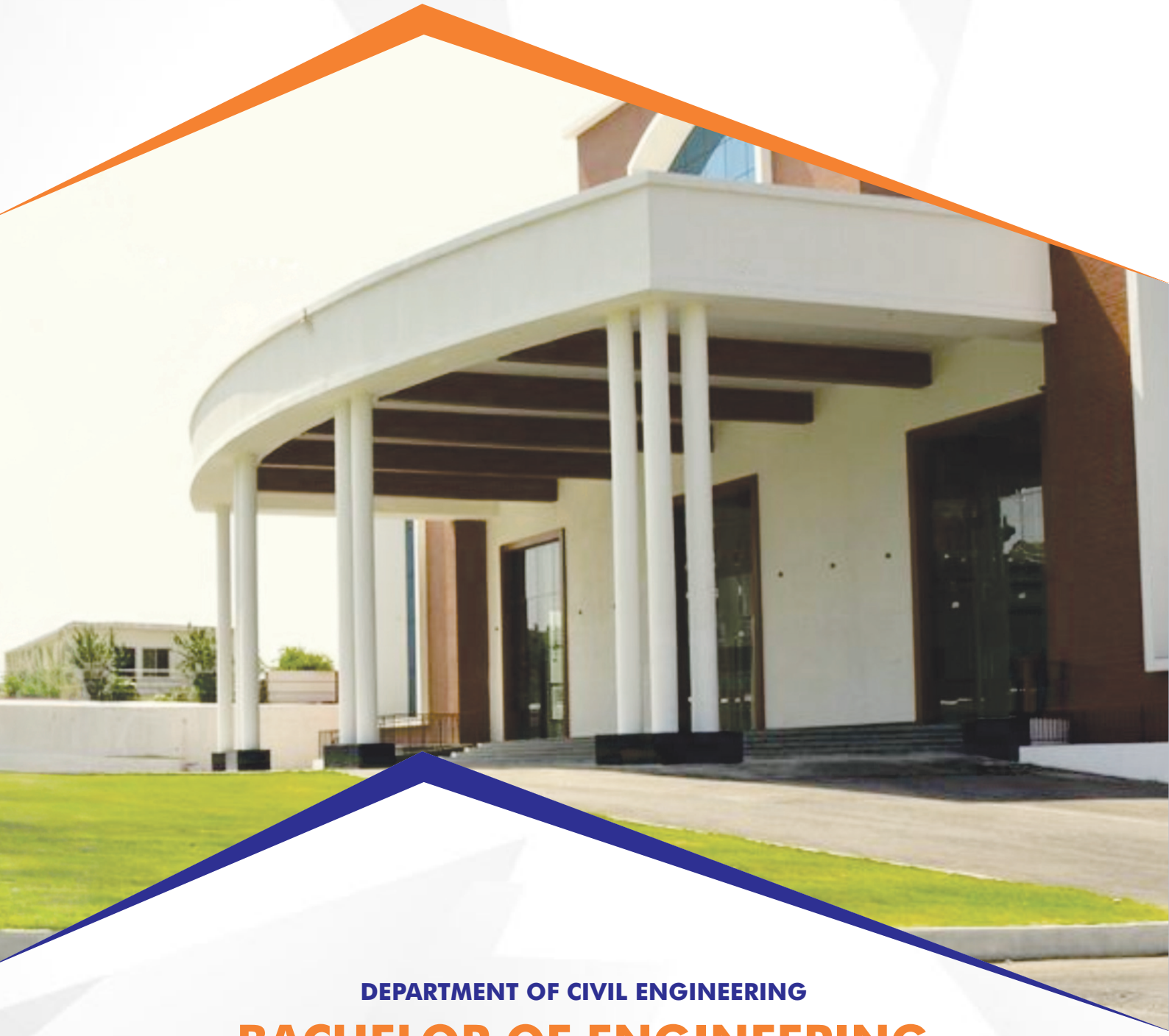
ESTD.: 2001
An Institute with a Difference

Dr. R N Shetty
Founder



DEPARTMENT OF CIVIL ENGINEERING

BACHELOR OF ENGINEERING

Scheme and Syllabus of III & IV Semesters

2024 SCHEME

www.rnsit.ac.in

Scheme and Syllabus
Batch 2024 - 2028

(As per NEP-2020)
(Effective from the academic year 2024 – 25)

About RNSIT

RNS Institute of Technology, familiar as RNSIT was established in the year 2001. It is the brainchild of Dr. R. N. Shetty, well known industrialist, and a great philanthropist. The institution was established with a sole purpose of imparting quality education in Engineering, Technology and Management. Being one of the premier engineering colleges in the country RNSIT is marching towards placing itself in the global map by excelling in academics and placements.

Lush green campus, state of the art infrastructure, well equipped laboratories, hundreds of activities, numerous new initiatives, consistent VTU ranks, path breaking placements, cultural extravaganza, Sports events, 4000 + students and 300 + faculty – with all these RNSIT has become dream destination for engineering aspirants across the country.

Vision

Building RNSIT into a World Class Institution

Mission

To impart high quality education in Engineering, Technology and Management with a difference, enabling students to excel in their career by

- Attracting quality Students and preparing them with a strong foundation in fundamentals so as to achieve distinctions in various walks of life leading to outstanding contributions
- Imparting value based, need based, choice based and skill based professional education to the aspiring youth and carving them into disciplined, World class Professionals with social responsibility
- Promoting excellence in Teaching, Research and Consultancy that galvanizes academic consciousness among Faculty and Students
- Exposing Students to emerging frontiers of knowledge in various domains and make them suitable for Industry, Entrepreneurship, Higher studies, and Research & Development
- Providing freedom of action and choice for all the Stakeholders with better visibility

About Civil Engineering

The Department of Civil Engineering is proud to offer a Bachelor of Engineering course in Civil Engineering under VTU from 2014-15 with an initial intake of 60 students, under the guidance of the great visionary in Civil Engineering constructions, Dr. R N Shetty.

The Civil Engineering Department of RNS Institute of Technology, Bangalore, aims to be a center of excellence in technical education and innovative applications, providing excellent professionals with integrity, besides being useful to all the stakeholders.

The department aims to be the best-rated department in college and in the university disseminating globally acceptable education, effective industrial consultancy and relevant research output.

Vision

Shaping Excellent Civil Engineering Professionals with Societal Focus

Mission

- To emphasize understanding of basic Engineering Concepts
- To develop creative ability to analyze and manage industry challenges
- To establish synergy between teaching and research

Programme Educational Objectives

1. **PEO1: Technical adeptness:** The Civil Engineering Graduates will be technically adept to specific fields and other disciplines like Physics, Mathematics and Management towards Planning, Design, and Costing. Their technical skills and knowledge will enable them to perform their work with a commitment and quality, timeliness with continuous improvement.
2. **PEO2: Interpersonal Skills:** Civil Engineering Graduates will exhibit effective interpersonal skills in teams and at work place.
3. **PEO3: Awareness of Social impact:** Graduates will be made aware of causes of impacts due to the development and also to identify remedial measures if necessary.
4. **PEO4: Professionalism:** Understanding of professionalism, ethics, quality performance, sustainability and allow them to be professional leaders and contributors to society through their problem-solving capabilities and executing the work.
5. **PEO5: Continuous Learning:** Civil Engineering Graduates will exhibit interest in lifelong learning including studies leading to professional licensure or higher studies in engineering that provides for continued development of their technical ability and management skills.

Program Outcomes (Revised)

1. **PO1: Engineering Knowledge**: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

2. **PO2: Problem Analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

3. **PO3: Design/Development of Solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

4. **PO4: Conduct Investigations of Complex Problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

5. **PO5: Engineering Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

6. **PO6: The Engineer and The World**: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

7. **PO7: Ethics**: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

8. **PO8: Individual and Collaborative Teamwork**: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

9. **PO9: Communication**: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

10. **PO10: Project Management and Finance**: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

11. **PO11: Life-Long Learning**: Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Programme Specific Outcomes (PSOs)

The Civil Engineering graduates will have

1. **PSO1**: **Project inception and design:** Conceptualize the projects related to different fields of Civil Engineering, collect relevant data by direct and indirect methods, analyze the project requirement and design the project.
2. **PSO2**: **Draft specification:** Select suitable/ feasible materials, prepare estimates and costs, schedule of work plans.
3. **PSO3**: **Experimentation:** Apply knowledge of different fields of Civil Engineering, conduct experiments, analyze, interpret data, and design the system components.

3rd Semester (Civil Engineering)

SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK				EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTICAL (P)	(TW + SL)*/ Sem (S)	DURATION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	PCC	BCV301	STRENGTH OF MATERIALS	CIVIL	3	0	0	45	3	50	50	100	3
2	IPCC	BCV302	ENGINEERING SURVEY	CIVIL	3	0	2	45	3	50	50	100	4
3	IPCC	BCV303	WATER SUPPLY AND WASTE WATER ENGINEERING	CIVIL	3	0	2	45	3	50	50	100	4
4	PCC	BCV304	ENGINEERING GEOLOGY	CIVIL	3	0	0	45	3	50	50	100	3
5	PCCL	BCVL305	BUILDING MATERIAL TESTING LAB	CIVIL	0	0	2	0	3	50	50	100	1
6	ESC	BCV306X	ESC/ETC/PLC (BUCKET LIST – A PROVIDED)	CIVIL	3	0	0	45	3	50	50	100	3
					2	0	2	30					
7	UHV	BSCK307	SOCIAL CONNECT AND RESPONSIBILITY	ANY	0	0	2	0	2	100	0	100	1
8	AEC/ SEC	BCVT/ L358X	BUCKET LIST – B PROVIDED	CIVIL	IF COURSE IS THEORY				2	50	50	100	1
					1	0	0	15					
					IF COURSE IS PRACTICAL				3				
					0	0	2	0					
9	MC	BNSK359	NATIONAL SERVICE SCHEME (NSS)	ANY	0	0	2	0	2	100	0	100	0
		BPEK359	PHYSICAL EDUCATION (PE) (SPORTS AND ATHLETICS)	PED									
		BYOK359	YOGA	PED									
	TOTAL									550	350	900	20

*** TW – Term Work, SL – Self Learning**

EMERGING SCIENCE COURSES / EMERGING TECHNOLOGY COURSES BUCKET LIST - A	
BCV306A	PROBABILITY THEORY AND STATISTICS
BCV306B	GEOINFORMATICS IN CIVIL ENGINEERING
BCV306C	EMERGING TRENDS IN CIVIL ENGINEERING
BCV306D	OCCUPATIONAL HEALTH AND SAFETY

ABILITY ENHANCEMENT COURSES / SKILL ENHANCEMENT COURSES BUCKET LIST - B	
BFLC358A	FOREGIN LANGUAGE COURSE 1- GERMAN
BFLC358B	FOREGIN LANGUAGE COURSE 1- SPANISH
BCVL358C	DATA ANALYTICS WITH EXCEL
BCVT358D	SMART URBAN INFRASTRUCTURE
BCVT358E	SUSTAINABLE BUILDING MATERIALS
BCVT358F	PERSONALITY DEVELOPMENT FOR CIVIL ENGINEERS

4th Semester (Civil Engineering)

SL NO	COURSE	COURSE CODE	COURSE TITLE	TD/ PSB	TEACHING HOURS PER WEEK				EXAMINATION				CREDITS
					THEORY LECTURE (L)	TUTORIAL (T)	PRACTICAL (P)	(TW + SL)*/ Sem (S)	DURATION IN HOURS	CIE MARKS	SEE MARKS	TOTAL MARKS	
1	PCC	BCV401	ANALYSIS OF STRUCTURES	CIVIL	3	2	0	45	3	50	50	100	4
2	IPCC	BCV402	FLUID MECHANICS AND HYDRAULIC MACHINES	CIVIL	3	0	2	45	3	50	50	100	4
3	IPCC	BCV403	CONCRETE TECHNOLOGY	CIVIL	3	0	2	45	3	50	50	100	4
4	PCCL	BCVL404	COMPUTER AIDED BUILDING PLANNING AND DRAWING	CIVIL	0	0	2	0	3	50	50	100	1
5	ESC	BCV405X	ESC/ETC/PLC (BUCKET LIST – C PROVIDED)	CIVIL	3	0	0	45	3	50	50	100	3
					2	0	2	30					
6	AEC/ SEC	BCVT/ L456X	BUCKET LIST – D PROVIDED	CIVIL	IF COURSE IS THEORY				2	50	50	100	1
					1	0	0	15					
					IF COURSE IS PRACTICAL				3				
					0	0	2	0					
7	BSC	BENS407/ BBOE407	ENVIRONMENTAL STUDIES / BIOLOGY FOR ENGINEERS	CIVIL /BT	2	0	0	30	2	50	50	100	2
8	UHV	BUHV408	UNIVERSAL HUMAN VALUES	ANY	0	0	2	0	2	50	50	100	1
9	MC	BNSK459	NATIONAL SERVICE SCHEME(NSS)	ANY	0	0	2	0	2	100	0	100	0
		BPEK459	PHYSICAL EDUCATION(PE) (SPORTS AND ATHLETICS)	PED									
		BYOK459	YOGA	PED									
	TOTAL									500	400	900	20

NOTE: (i) 1st semester Chemistry cycle sections will study "ENVIRONMENTAL STUDIES" in 4th semester & "BIOLOGY FOR ENGINEERS" in 5th semester
(ii) 1st semester Physics cycle sections will study "BIOLOGY FOR ENGINEERS" in 4th semester & "ENVIRONMENTAL STUDIES" in 5th semester

***TW – Term Work, SL – Self Learning**

EMERGING SCIENCE COURSES / EMERGING TECHNOLOGY COURSES BUCKET LIST - C	
BCV405A	**WATERSHED MANAGEMENT**
BCV405B	**CONSTRUCTION EQUIPMENTS, PLANTS AND MACHINERY**
BCV405C	**ENERGY EFFICIENCY ACOUSTICS AND DAYLIGHTING IN BUILDINGS**
BCV405D	**AIR POLLUTION AND MONITORING**

ABILITY ENHANCEMENT COURSES / SKILL ENHANCEMENT COURSES BUCKET LIST - D	
BFAT456A	**FINANCE AND ACCOUNTING**
BCVL456B	**BUILDING CONSTRUCTION LAB**
BCVT456C	**TECHNICAL WRITING SKILLS**
BCVT456D	**PLUMBING AND DRAINAGE SYSTEM FOR RESIDENTIAL BUILDINGS**
BCVT456E	**ELECTRICAL WIRING AND SAFETY FOR BUILDINGS**

III SEMESTER SUBJECTS

B.E. (Civil Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Course Title:	**Strength of Materials**		
Course Code:	**BCV301**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**3**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Analyze stresses and strains in structural elements such as bars and beams under axial, thermal, and composite loading conditions to understand material behavior and structural response.
2. Evaluate internal forces, shear forces, and bending moments in beams under various loading conditions and construct diagrams to interpret the results.
3. Apply bending, shear stress, and buckling theories to assess the stability and strength of beams and columns for different cross-sections and end conditions.
4. Analyze trusses and compound stress states using methods like joints and sections, and determine principal stresses and failure criteria for stability and design optimization.

Module–1: Simple Stresses and Strains **9 Hours**

Simple Stresses and Strains: Stress Strain behaviour of mild steel and concrete, Analysis of bars of uniform and varying(stepped) cross sections, Analysis of Simple and Composite bars of equal and unequal lengths, Expression of Elastic constants and interrelationship. Thermal stress in simple and composite bars, Volumetric strain.

Module–2: Shear Force and Bending Moment in Beams **9 Hours**

Shear Force and Bending Moment In Beams: Shear forces and bending moments, Sign conventions, Relationship between shear force and bending moments Shear force and bending moment diagrams on Simply Supported Beams, Overhanging beams, and Cantilever beams subjected to concentrated loads, uniform distributed load, uniform varying load, couple and their combinations.

Module– 3: Bending and Shear Stresses in Beams **9 Hours**

Bending Stress in Beams: Introduction, Assumptions in simple bending theory, Expression for Bending equation, Modulus of rupture, Section modulus, Flexural rigidity, Bending stress distribution in beams of rectangular, I section and T-sections.

Shear Stresses in Beams: Expression for horizontal shear stress in beam, Shear stress diagram for simple rectangular, I section and T-sections.

Module–4: Compound Stresses and Stability of Columns **9 Hours**

Compound Stresses: Introduction, state of stress at a point, General two-dimensional stress system, Principal stresses and principal planes.

Analysis of Columns and Struts: Introduction, Euler's theory on columns, Effective length, Slenderness ratio, Short and long columns, Radius of gyration, Buckling load, Expression for Euler's Buckling load for different end conditions, Limitations of Euler's theory, Rankine's formula. Eccentric loading.

Module–5: Introduction to Structural Forms and Truss Analysis **9 Hours**

Introduction to Structural Forms: Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and nonlinear analysis, Static and kinematic indeterminacies of structural systems.

Analysis of Plane Trusses: Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints and method of sections.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the behaviour of materials and structural members subjected to loads.
CO2	Apply the method of joints and sections for determinate trusses.
CO3	Analyze various stresses in determinate beams and columns subjected to various loading conditions.
CO4	Evaluate shear force, bending moment and stress distributions in determinate beams under various loading conditions.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Suggested Learning Resources:

Textbooks

1. R. K. Bansal, "A Textbook of Strength of Materials: Mechanics of Solids," 7th ed., Laxmi Publications, 2024.
2. S. Ramamrutham, "Theory of Structures," 9th ed., Dhanpat Rai Publishing Company Private Limited, New Delhi, 2010.
3. R. S. Khurmi and N. Khurmi, "A Textbook of Strength of Materials: Mechanics of Solids (SI Units)," 26th ed., S. Chand Publishers, New Delhi, 2018.
4. H. S. Vishwanath and J. B. K. Das, "Strength of Materials," Sapna Book House, 2019.

Reference Books

1. C. S. Reddy, "Basic Structural Analysis," 3rd ed., Tata McGraw Hill Publication Company Ltd., New Delhi, 2017.
2. R. C. Hibbeler, "Mechanics of Materials," 11th ed., Pearson Education, London, 2023
3. S. P. Timoshenko and D.H. Young, "Elements of Strength of Materials," 5th ed., Affiliated East-West Press, 2003.
4. F. P. Beer and E. R. Johnston, "Mechanics of Materials," 8th ed., McGraw-Hill Publishers, 2020.

B.E. (Civil Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – III			
Course Title:	**Engineering Survey**		
Course Code:	**BCV302**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:2) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**4**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand fundamental principles, methods, and importance of engineering surveying.
2. Gain proficiency in traditional and modern surveying techniques, including total stations and GPS.
3. Develop skills in contour mapping, curve setting, and volume estimation for civil engineering applications.
4. Learn the application of advanced surveying tools like LIDAR and GIS in modern construction.

MODULE – 1 **9 Hours**

Engineering surveying – Definition, principles, objectives and importance of surveying for Civil Engineers. Surveying types- Control survey, Topographical surveying, Construction Survey, Cadastral survey, Hydrographic survey and Underground Survey. Surveying through the ages- **Chain surveying**, Definition and types of chains and direct ranging using chain. **Compass surveying,** Basic definitions; meridians, bearings, magnetic and True bearings. Prismatic and surveyor's compasses, temporary adjustments. Quadrantal bearings, whole circle bearings, local attraction and related problems.

Plane Table Surveying: plane table and accessories, advantages and disadvantages of plane table survey, method of plotting - radiation, intersection method.

MODULE – 2 **9 Hours**

Measurement of Distance- Various types of tapes, Laser distance meter, Distance measuring wheel, Electronic Distance measurement, GPS.

Levelling – Principles and Terms used in levelling – Types of Levels – Types of adjustments and objectives – Types of levelling – Simple, Differential, Fly, Reciprocal, booking of levels – Rise & fall and H. I methods.

Theodolite Surveying – Terms used in Theodolite surveying. Setting up a Theodolite. Measurement of Horizontal and Vertical angle measurements by repetition and reiteration.

MODULE – 3 **9 Hours**

Introduction Total Station– Features, parts, accessories and advantages of Total Station. Measurement of coordinates using total station. Creating Job files, importance of back sight data, coordinate data recording. Data transferring, data refinement and plotting in CAD.

Liner and angular measurements using Total station – Measurement of Horizontal angle, vertical angle, horizontal distance, slope distance, vertical distance and area using Total station.

Longitudinal and cross sectioning – Definition, importance of L/S & C/S. L/S & C/S using level, and Total station. Plotting of L/S & C/S in CAD.

Contours - Definition terms used, characteristics of contours and applications of contours in civil engineering practice. Contouring using direct and indirect method. Plotting of contours in CAD.

MODULE – 4 **9 Hours**

Curves –Types of Curves- Application of Horizontal curve and vertical curves in civil engineering. Setting out simple by Rankine's method, Transition Curve using Total Station. Components of Compound, Reverse curve and Combined curve. **Areas and Volumes-** Methods of determining areas by trapezoidal and Simpsons' rule. Measurement of volume by Prismoidal and trapezoidal formula. Earthwork volume calculations from spot levels and from contour maps. **Construction Surveying -** Setting out works using Total Station, Setting out buildings by Centre line method.
MODULE – 5 **9 Hours**
Survey map: Study of topo sheets and applications **Modern Surveying Instruments–** LIDAR (Light Detection and Ranging), Introduction, applications and advantages. Principles of GPS & GNSS (Global Navigation Satellite Systems), Applications, advantage and disadvantages of Drone surveying and DGPS. **Remote sensing and GIS:** Application and uses of Remote sensing and GIS in engineering surveying.

PRACTICAL COMPONENT OF IPCC	
Sl. No.	**Experiments**
1	Demonstration of Equipment's used for chain, compass and plane table surveying.
2	Use of Various types of tapes, Laser distance meter, Distance measuring wheel.
3	Differential levelling by Dumpy level by plane of collimation method
4	Measurement of horizontal and vertical angles by Theodolite. Method of repetition
5	Setting up of Total station. Features and components of Total station
6	Measurement of Distance, slope, vertical distance, horizontal and vertical angles using Total Station
7	Coordinate measurement with Total station
8	Longitudinal sectioning and cross sectioning using Dumpy level and Total station.
9	Setting out simple curve using Rankine's method using Total station.
10	Setting out central line of a small residential building.
11	Contouring and plotting with Total station
12	Visit to railway station/ large construction site to understand the importance of datum and benchmark.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain surveying principles, methods, and instrument operations for accurate measurements.
CO2	Utilize traditional and modern instruments for distance, angle, elevation, and coordinate measurements.
CO3	Apply total station, contouring and curve setting techniques in construction and land surveying.
CO4	Implement advanced surveying tools like LIDAR, GPS, and GIS for precise data analysis and mapping.

ASSESSMENT DETAILS (Both CIE and SEE)

4-Credit Lab Integrated Theory Courses (IPCC)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	**20**	**8**	**Marks of Experiments, Record and Test awarded for a maximum of 20 marks.**
CIE: Theory + Practical (A + B + C)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (D)	**50**	**18**	**SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE+SEE (A+B+C+D)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B, C and D**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only			

Suggested Learning Resources:

Text books

1. B C Punmia and Jain Ashok Kumar. "Surveying" 17th ed., Vol. 1. Laxmi Publications, 2016.
2. K R Arora, "Surveying", 17th ed., Vol. 1. Standard Book House, 2019.
3. Charles D. Ghilani. "Engineering Survey", 13th ed., Prentice Hall, 2012.
4. H S Vishwanath, "Basic Surveying", Sapna Book House, 2019.

Reference books

1. G. Singh and J. Singh. "Surveying" 12th ed., Khanna Publishers, 2024.
2. R. Agor. "Surveying" 5th ed., Khanna Publishers, 1991.

3. Dr. A M Chandra. "Surveying" New Age International (P) Ltd., Publishers, 2005.
4. W. Schofield. "Engineering Surveying" 3rd ed., Elsevier Ltd, 1984.

B.E. (Civil Engineering)
Outcome Based Education(OBE) and Choice Based Credit System(CBCS)
SEMESTER – III

Course Title:	**Water Supply and Waste Water Engineering**		
Course Code:	**BCV303**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:2) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**4**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Evaluate the appropriateness of water sources and their suitability for a township to ensure efficient supply.
2. Examine and assess the physical, chemical, and biological treatment methods employed for water and wastewater treatment to achieve the required quality standards for diverse applications.
3. Analyze advanced treatment technologies by studying case studies and investigating cutting-edge research in the field.
4. Evaluate the quality of wastewater and its environmental impact, with particular attention to the influence of critical parameters when released into natural ecosystems.

Module – 1: Fundamentals of Water Supply **9 Hours**

Demands For Water: Need for protected water supply, units of measurements (TMC, MLD, KLD, Cumec, and Cusec), types of water demand, numerical problem on fire demand.
Population Forecasting: Different methods with merits & demerits, numerical problems on arithmetic increase method, geometric increase method, incremental increase method and decrease growth rate method.
Collection of Water: Intake structures – Different types of intakes; Criteria for selection and location of intakes.
Water Treatment Methodologies: Treatment flow-chart. Aeration - principles, application and types of aerators.

Module – 2: Primary and Secondary Water Treatment **9 Hours**

Sedimentation: Theory of sedimentation, Stokes law, settling velocity, C/S of settling tank, types, numerical problems on design of rectangular settling tank.
Coagulation: Requirements of a good coagulant, types of coagulants, jar test; Clari-flocculator.
Filtration: Mechanism – Theory of filtration, types.
Slow Sand Filter (SSF) & Rapid Sand Filter (RSF): C/S diagram, filter media, working principle & numerical problems on design of SSF & RSF.
Pressure Filter (PF): C/S diagram, filter media, working principle of PF.
Comparative Study: Advantages, disadvantages and suitability of SSF, RSF & PF

Module – 3: Tertiary Water Treatment & Distribution **9 Hours**

Disinfection: Theory of disinfection, types of disinfection, requirements of a good disinfectant. Chlorination- Stages of chlorination, breakpoint chlorination, residual chlorine.
Softening: Definition, causes of hardness, methods of hardness removal by Lime soda process and Zeolite process; Reverse Osmosis & Membrane reactor.
De-Fluoridation: Need of de-fluoridation, methods of de-fluoridation.
Distribution System: Methods of setting water distribution system layouts.
Waste Water Treatment: Flow diagram of municipal wastewater treatment plant; Importance of each treatment unit.

Module – 4: Biological Treatment of Wastewater **9 Hours**

Dissolved Oxygen (DO) & Biochemical Oxygen Demand (BOD): Importance of DO and BOD, First stage and second stage BOD (No Derivation); Basic numerical problems on BOD.
Aerobic And Anaerobic Digestion: Concept and principle.
Attached Growth System:
Trickling Filter-C/S diagram & components, working principle & process description, numerical problems on design of trickling filter; Rotating biological contactor.
Suspended Growth System:
Activated Sludge Process (ASP)- Flow diagram, working principle & process description, importance of recirculation, list of modifications in ASP; F/M Ratio & MLSS. Numerical problems on design of activated sludge process.

Module – 5: Low-Cost Wastewater Treatment and Disposal **9 Hours**

Low-Cost Wastewater Treatment Methods: Septic Tank- Importance, plan and section, numerical problems on design of septic tank. Soak pit, oxidation pond and oxidation ditch, anaerobic & facultative stabilization ponds.
Disposal Of Effluents: Disposal of effluents by dilution, self-purification phenomenon. Oxygen sag curve, zones of purification, effluent disposal standards. Streeter Phelps equation.
Latest Innovative Developments in Wastewater Treatment.

EXPERIMENTS:

1. Reviewing of Drinking water standards as per BIS & WHO guidelines. (Physical, chemical and biological)
2. Assessment of solid content in water and wastewater, including various physical and chemical classifications.
3. Estimation of chloride concentration in water samples to evaluate salinity levels.
4. Analysis of buffering capacity in water through alkalinity measurement.
5. Examination of water corrosiveness and pollution indicators via acidity testing.
6. Measurement of hydrogen ion concentration to assess water's acid-base balance.
7. Quantification of hardness-causing minerals, focusing on calcium, magnesium, and total hardness levels.
8. Evaluation of oxygen availability and biological stability through Dissolved Oxygen and Biochemical Oxygen Demand analysis.
9. Determination of Chemical Oxygen Demand to assess organic load in wastewater.
10. Quantitative analysis of active chlorine content in bleaching powder for disinfection efficiency.
11. Monitoring of post-treatment chlorine levels and calculation of chlorine demand in water samples.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of water demand, population forecasting, water quality parameters, and treatment methodologies, in accordance with BIS and WHO standards.
CO2	Design and analyze various units of water and wastewater treatment systems using appropriate principles.
CO3	Determine and interpret results of physical, chemical, and biological parameters pertaining to water and wastewater.
CO4	Evaluate advanced treatment technologies and assess the environmental impacts of treated

ASSESSMENT DETAILS (Both CIE and SEE)

4-Credit Lab Integrated Theory Courses (IPCC)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	**20**	**8**	**Marks of Experiments, Record and Test awarded for a maximum of 20 marks.**
CIE: Theory + Practical (A + B + C)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (D)	**50**	**18**	**SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE+SEE (A+B+C+D)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B, C and D**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only			

Suggested Learning Resources:

Text Books

1. S. K. Garg, "Environmental Engineering-Water Supply Engineering", 37th ed., vol. I, Khanna Publishers, 2024.
2. S. K. Garg, "Environmental Engineering- Sewage Waste Disposal and Air Pollution Engineering", 46th ed., vol. II, Khanna Publishers, 2024.
3. B. C. Punmia , Er. Ashok Kr. Jain , Dr. Arun Kumar Jain, "Environmental Engineering-Water Supply Engineering", 2nd ed., vol. I Laxmi Publications, 2022.

4. B. C. Punmia , Er. Ashok Kr. Jain , Dr. Arun Kumar Jain “Environmental Engineering-Water Supply Engineering”, 2nd ed., vol. II Laxmi Publications, 2022.

Reference Books

1. S. Howard Peavy, R. Donald Rowe, T. George, “Environmental Engineering”, McGraw Hill, 2017.
2. Metcalf & Eddy, “Waste Water Engineering: Treatment & Reuse”, 4th ed., McGraw Hill Education, 2023.
3. M. J. Hammer, “Water and Waste Water Technology", 7th ed., Pearson, 2011.
4. CPHEEO, “Manual on Water Supply and Treatment”, 3rd ed., Ministry of Urban Development, 1999.

B.E. (Civil Engineering)
Outcome-Based Education(OBE) and Choice-Based Credit System(CBCS)
SEMESTER – III

Course Title:	**Engineering Geology**		
Course Code:	**BCV304**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**3**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the basic principles of physical geology, mineralogy, and tectonics relevant to civil engineering.
2. Identify various types of rocks, weathering effects, and soil formations and relate them to construction suitability.
3. Explain the processes of groundwater movement and apply geophysical methods for subsurface water exploration.
4. Apply geological investigation techniques for evaluating the safety and suitability of engineering project sites.

Module-1: Fundamentals of Geology and Tectonics **9 Hours**

Introduction: Geology and its significance in Civil Engineering, Earth's Structure and Composition. Geological Time Scale. Tectonic Activities: Types, Causes, Isoseismic Lines, and Seismic Zonation of India.

Mineralogy: Physical properties, Identification of important Rock-forming minerals and economic minerals.

Module-2: Earth Materials and their Engineering Significance **9 Hours**

Petrology: Rock Cycle, Formation, Classification of Igneous, Sedimentary, Metamorphic Rocks. Engineering Properties of Rocks and Their Suitability in Construction.

Weathering: Types and Causes. Influence of Weathering on Civil Engineering Structures. Soil Profile, Soil Structure and Clay Mineralogy, Indian Soil Groups. Soil Erosion: Prevention and Control.

Module-3: Hydrogeology **9 Hours**

Hydrological Cycle, Zonal Distribution of Subsurface Water, Water-Bearing Qualities of Rocks. Types of Aquifers, Aquifer Functions: Porosity, Specific Yield, Specific Retention, Permeability, Darcy's Law, Coefficient of Permeability.

Groundwater Exploration: Introduction to Geophysical Exploration, Seismic Method, Electrical Resistivity Method.

Module-4: Structural Geology and Rock Deformation **9 Hours**

Deformation in Rocks, Dip and strike, Faults, Folds, Unconformity, Joints: Classification, Recognition. Causes. Engineering Importance of Geological Structures. Determining the thickness of strata. Interpretation of Geological Section Maps.

Module-5: Geological Investigations for Civil Engineering Projects **9 Hours**

Geological Investigation: Methods of Investigation: Surface Investigation, Subsurface Investigation. Interpretation of borehole data, Rock Quality Designation (RQD), and Rock Structure Rating (RSR). Geological investigations for site selection of dams, reservoirs, tunnels, bridges, and highways, including case studies on each construction type.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the internal structure of the Earth, the geological time scale, and key physical properties of minerals.
CO2	Identify and interpret various types of rocks, weathering effects, and soil formations, and relate them to their suitability for construction.
CO3	Interpret groundwater properties and apply basic geophysical methods for subsurface water exploration.
CO4	Assess geological and structural investigation techniques to assess site suitability for civil engineering structures like dams, tunnels, and highways.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Suggested Learning Resources:

Text Books

1. Parbin Singh, "Engineering Geology and General Geology," 10th ed., Katson Educational Series, 2018.
2. K. M. Bangar, "Principles of Engineering Geology," 3rd ed., Standard Publishers Distributors, 2023.
3. K. V. G. V. Gokhale, "Principles of Engineering Geology," 3rd ed., B S Publication, 2023.

Reference Books

1. P. K. Mukerjee, "A Textbook of Geology," 13th ed., The World Press Private Limited, 2015.
2. G. B. Mahapatra, "Textbook of Physical Geology" 1st ed., CBS Publishers and Distributors Pvt Ltd, 2018.
3. Billings Marland, "Structural Geology," 3rd ed., Pearson Education, 2016.
4. P.B. Attwell and I.W. Farmer, "Principles of Engineering Geology," 1st ed., Springer, 2011.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title:	**Building Materials Testing Lab**		
Course Code:	**BCVL305**	**CIE Marks**	**50**
(L :T : P)	**0:0:2**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate learner to:

1. Understand and perform tests on masonry units and concrete blocks for construction suitability.
2. Analyze the physical properties of aggregates for quality assessment and material comparison.
3. Comprehend the mechanical behavior of construction materials under various loading conditions.

Sl. No.	EXPERIMENTS
1	Tests on bricks, tiles, interlocking blocks, lightweight blocks, and cement concrete blocks (Weight & Dimensionality, Strength).
2	Tests on Fine aggregates - Sieve Analysis, Moisture Content, Specific Gravity, Bulk Density, Bulking Comparison between M-Sand and River Sand.
3	Tests on Coarse aggregates - Sieve Analysis, Water Absorption, Moisture Content, Specific Gravity, and Bulk Density
4	Compression Test on Mild Steel, Cast Iron, and Wood.
5	Tension Test on Mild Steel and HYSD Bars.
6	Torsion Test on Mild Steel Circular Sections.
7	Bending Test on Wood Under Two-Point Loading.
8	Shear Test on Mild Steel - Single and Double Shear.
9	Impact Test on Mild Steel (Charpy & Izod).
10	Brinell's, Rockwell, and Vickers Hardness Tests.
11	Use of Strain Gauges and Strain Indicators.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Perform standard tests on masonry units and concrete blocks to determine their dimensional accuracy, weight, and compressive strength for evaluating construction suitability.
CO2	Conduct and interpret tests on aggregates to assess key physical properties for quality control and material selection
CO3	Demonstrate understanding of mechanical behavior of construction materials to assess structural performance.

ASSESSMENT DETAILS (Both CIE and SEE)

1-Credit Lab Course			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Text books

1. M. L. Gambhir and Neha Jamwal, "Building and Construction Materials", – Testing and Quality Control, McGraw Hill Education (India) Pvt. Ltd., 2014.
2. A. K. Suryanarayana, "Testing of Metallic Materials", Prentice Hall of India Pvt. Ltd., New Delhi, 2015.

Reference Books:

1. C. B. Kukreja, K. Kishore, and Ravi Chawla, "Material Testing Laboratory Manual", Standard Publishers & Distributors, 1996.
2. S. K. Duggal, "Building Materials", 5th ed., New Age International Publishers, 2009.
3. Relevant latest IS Codes.

B.E. (CIVIL Engineering)
Outcome Based Education(OBE) and Choice Based Credit System(CBCS)
SEMESTER – III

Course Title:	**Probability Theory and Statistics**		
Course Code:	**BCV306A**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**3**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand foundational principles of probability theory to analyze and solve problems involving uncertainty and random events in engineering contexts.
2. Apply concepts of random variables and mathematical expectation to model real-world civil engineering systems with stochastic elements.
3. Organize, summarize, and interpret data using descriptive statistics to aid in informed decision-making and reporting in engineering projects.
4. Implement various sampling techniques and analyze sampling distributions for quality control and project analysis in civil engineering applications.
5. Formulate and test statistical hypotheses using parametric and non-parametric methods to validate engineering assumptions and support data-driven conclusions.

Module-1: Introduction to Probability Theory	**9 Hours**
Definition and types of probability (classical, empirical, axiomatic), Sample space and events, Axioms of probability, Addition and multiplication theorems, Conditional probability, Independence of events Bayes' Theorem and applications.	

Module-2: Random Variables and Expectation	**9 Hours**
Concept of random variables (discrete and continuous), Functions of random variables , Mathematical expectation, Properties of expectation, Moments and moment generating functions, Chebyshev's inequality.	

Module-3: Descriptive Statistics and Data Presentation	**9 Hours**
Types of data (nominal, ordinal, interval, ratio), Classification and tabulation of data, Frequency distribution, Measures of central tendency (mean, median, mode), Measures of dispersion (range, variance, standard deviation, coefficient of variation), Skewness and kurtosis, Graphical representation (histogram, bar chart, pie chart, box plot).	

Module-4: Sampling and Sampling Distributions	**9 Hours**
Sampling techniques (random, stratified, systematic, cluster), Sampling distribution of mean and variance, Central Limit Theorem, Standard error, Estimation: Point and interval estimation, Confidence intervals for means and proportions.	

Module-5: Hypothesis Testing and Non-parametric Methods	**9 Hours**
Formulation of hypothesis (null and alternative), Type I and Type II errors, Level of significance and power of a test, z-test and t-test (single sample and two sample), Chi-square test for independence and goodness of fit, Introduction to non-parametric tests (Sign test, Wilcoxon test), Use of statistical tools in civil engineering (quality control, reliability).	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply the fundamental concepts of probability to compute event likelihoods and solve problems involving conditional probability and Bayes' theorem.
CO2	Analyze and interpret random variables and compute expected values and moments to evaluate uncertainty in engineering scenarios.
CO3	Organize, present, and describe engineering data using appropriate statistical measures such as central tendency, dispersion, skewness, and kurtosis.
CO4	Employ sampling methods and use sampling distributions and estimation techniques to make inferences from sample data.
CO5	Formulate hypotheses and apply suitable statistical tests (z-test, t-test, chi-square test, and non-parametric tests) for effective decision-making in civil engineering contexts.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. • **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**			

Suggested Learning Resources:

Text Books

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11th ed., New Delhi, India: Sultan Chand & Sons, 2014.
2. T. Veerarajan, Probability, Statistics and Random Processes, 4th ed., New Delhi, India: Tata McGraw-Hill Education, 2008.

Reference Books

1. R. A. Johnson, Probability and Statistics for Engineers, 9th ed., Boston, MA, USA: Pearson Education, 2017.
2. R. E. Walpole, R. H. Myers, S. L. Myers, and K. Ye, Probability and Statistics for Engineers and Scientists, 9th ed., Boston, MA, USA: Pearson Education, 2012.

B.E. (Civil Engineering) Outcome-Based Education(OBE) and Choice-Based Credit System(CBCS) SEMESTER – III			
Course Title:	**Geoinformatics in Civil Engineering**		
Course Code:	**BCV306B**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**3**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the basic principles and components of Geoinformatics, including Remote Sensing, GIS, and GPS.
2. Explain data acquisition techniques and geo referencing methods using modern geospatial tools.
3. Illustrate positioning techniques and modern trends like Web GIS, AI, and ML in geoinformatics.
4. Apply geoinformatics tools in solving real-world civil engineering problems like LULC, disaster, and water resource management.

Module-1: Introduction to Geoinformatics **9 Hours**

Overview of Geoinformatics: Definition and scope in civil engineering. Applications in planning, design, and decision-making.

Introduction to Remote Sensing & GIS: Fundamentals: Electromagnetic spectrum and energy interactions. Types of remote sensing: Active and passive Sensors. Components of GIS- Hardware, software, data, people, and methods. Spatial and non-spatial data types.

Module-2: Data Acquisition and Georeferencing **9 Hours**

Geographic Data Acquisition: Introduction to Scale**,** Primary data collection: Remote sensing, GPS surveys, and field surveys. Secondary data sources: Maps, aerial photographs, and open data portals.

Georeferencing: Definition and need for georeferencing. Coordinate systems: Geographic and projected coordinate systems. Map projections and datum concepts.

Module-3: Positioning Techniques **9 Hours**

Global Positioning System (GPS): Introduction and working principles. Components of GPS, principle of ranging, types of receivers, GPS satellite signals, Precise Point Positioning (PPP), Demonstration of Handheld GPS for acquiring the PPP, Waypoints.

Differential GPS: DGPS, concepts and principles, differential corrections, local area DGPS, wide area DGPS. Ground control points, field observations, criteria for selecting reference stations, post-processing, and Receiver Independent Exchange Format (RINEX). Applications of DGPS in the field survey.

Module-4: Advanced Geoinformatics **9 Hours**

Web GIS Fundamentals: Definition, Concept of Web GIS, Web GIS Architecture and Components. Use of Python in Web GIS, Advantages of Web GIS. Location-based service.

Emerging Trends in Geoinformatics: Role of Artificial Intelligence (AI) and Machine Learning (ML) in Geoinformatics.

Module-5: Applications of Geoinformatics in Civil Engineering **9 Hours**

Land use – Land cover: Application of Geoinformatics in the study of Land use- Land cover (LULC) analysis, and change detection. Case study on LULC.

Disaster Management: Role of Geoinformatics in disaster risk assessment and response planning. Case studies: Landslide management.

Water Resource Management: Role of Geoinformatics in Irrigation Management. Case studies: flood risk assessment.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the core concepts of Remote Sensing, GIS, and GPS in the field of Civil Engineering
CO2	Identify and interpret various geospatial data sources and georeferencing techniques
CO3	Demonstrate the application of GPS, DGPS, Web GIS, and emerging geoinformatics tools in positioning and spatial analysis.
CO4	Apply geoinformatics to analyze civil engineering scenarios in land use, disaster, and water resource management.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. • **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**			

Suggested Learning Resources:

Textbooks

1) N. Kalita, A.K. Bora, "Geoinformatics: Theory and Practice," 1st ed., EBH Publishers, 2023.
2) Alfred Leick, "GPS Satellite Surveying," 3rd ed., Wiley India Pvt Ltd., 2012.
3) M. Anji Reddy, "Textbook of Remote Sensing and Geographical Information Systems," 4th ed., BS Publications, 2012.
4) Chor Pang Lo and Albert K.W. Yeung, "Concepts and Techniques of Geographic Information Systems," 2nd ed., Pearson Education, 2016.

Reference Books

1) P.K. Garg, **"**Principles and Theory of Geoinformatics," 1st ed., Khanna Book Publishing, 2019.
2) Heywood, Ian, Cornelius Sarah, Carver and Steve, "Introduction to Geographical Information Systems, 4th ed., Pearson Publication, 2011.
3) N. K. Agrawal, "Essentials of GPS," 1st ed., BS Publications, 2021.
4) Jayanta Kumar Ghosh, "A Text Book on GPS Surveying," 1st ed., Create Space Independent Pub, 2015.

B.E. (Civil Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Course Title:	**Emerging Trends in Civil Engineering**		
Course Code:	**BCV306C**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**3**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Develop a conceptual understanding of advanced technologies like AI, ML, IoT, AR/VR, Robotics, and their integration in civil engineering
2. Employ smart tools and techniques for enhancing processes like curing, monitoring, and project planning in construction.
3. Examine sensor-generated data and system behaviour to support data-driven decision-making in construction.
4. Evaluate the success and impact of intelligent construction methods through real-world case studies and field implementations.

Module–1: Augmented Reality(AR) and Virtual Reality(VR) **9 Hours**

AR and VR – Introduction, Definitions, Advantages, and Limitations; Role of AR in construction planning and visualization, Virtual walkthroughs and simulation, Working principles of AR and VR devices, Applications of VR, Hardware and software tools (basic concepts only), Case Study– Use of AR mobile apps to visualize simple 2D residential building layouts in 3D.

Module–2: Artificial Intelligence (AI) in Civil Engineering **9 Hours**

Introduction, Definitions, Early history of AI, Current Status of AI, Advantages and limitations of AI, Applications of AI– Design and Planning, Construction Management, Infrastructure Management and Other relevant Applications. Types of AI–Genetic Algorithms, Artificial Neural Networks (ANN) and Fuzzy Logic (basic concepts only).

Module– 3: Machine Learning (ML) in Civil Engineering **9 Hours**

Definition and scope of ML, Differences between AI and ML, Importance of ML in Civil Engineering, Types of ML – Supervised and Unsupervised learning (basic concepts only); Common ML Algorithms – Linear Regression and K-Means Clustering; Simple numerical examples.

Module–4: Internet of Things (IoT) in Civil Engineering **9 Hours**

Introduction to IoT in Smart Infrastructure, Applications of simulation software (basic concepts only), Sensor-based structural monitoring using IoT, Integration of IoT with Concrete Curing and Non-Destructive Testing (NDT) Techniques, Data-driven and Analytical prediction techniques in Civil Engineering, Numerical examples on IoT-enabled data monitoring and interpretation in intelligent infrastructure systems.

Module–5: Robotics in Civil Engineering **9 Hours**

Introduction to Robotics- Definition for Robot, Asimov's laws of robotics**,** Components of a Robot, Classification of Robots, Robot Anatomy; Applications of robotics in the construction industry, Types of robots used in construction–Demolition robots, Brick-laying robots, Exo-skeleton robots, Welding and fabrication robots; Role of robotics in enhancing safety, quality, and productivity in construction; Limitations and future scope of robotics in Civil Engineering, Case Study– Robotic 3D-printed house and bridge project.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the applications of AI, ML, IoT, AR/VR, Robotics in civil engineering.
CO2	Apply smart tools and techniques in concrete curing, structural monitoring, and project planning.
CO3	Analyze sensor data and systems for informed decision-making in construction.
CO4	Evaluate smart solutions through case studies and real-world examples.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Suggested Learning Resources:

Textbooks

1. Vagelis Plevris, Afaq Ahmad and Nikos D. Lagaros, "Artificial Intelligence and Machine Learning Techniques for Civil Engineering," IGI Global, 2023.

2. D. Schmalstieg, and T. Hollerer, "Augmented Reality: Principles and Practice," 1st ed., Addison-Wesley Professional, 2016.
3. A. Bahga and V. Madisetti, "Internet of Things: A Hands-On Approach", 1st ed., Universities Press (India) Private Limited, 2015.
4. T. Bock and T. Linner, "Robot-Oriented Design: Design and Management Tools for the Deployment of Automation and Robotics in Construction," 1st ed., Cambridge University Press, 2015.

B.E. (Civil Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Course Title:	**Occupational Health and Safety**		
Course Code:	**BCV306D**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**3**	**Exam Hours**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Gain historical, economic, and organizational perspective of occupational safety and health.
2. Investigate current occupational safety and health problems and solutions.
3. Identify the forces that influence occupational safety and health.
4. Demonstrate the knowledge and skills needed to identify work place problems and safe work practice.

Module-1: Introduction **9 Hours**

Introduction: Relevance of Occupational Health and Safety (OHS) in Global industrial scenario and impacts on economy. History and development, National Safety Policy.

Occupational Hazard and Control Principles:

Occupational safety and Health Act. (OSHA), Limitation, Administration laws governing OSHA and right to know. Accident – causation, investigation, investigation plan, Methods of acquiring accident facts. Supervisory role in accident investigation. Program Workers' Compensation - Unsafe Acts vs. Unsafe Conditions.

Module-2: Ergonomics at Work Place and Indoor Air Quality **9 Hours**

Ergonomics at Work Place:

Ergonomics Task analysis, Preventing Ergonomic Hazards, Work space Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs. Hazard cognition and Analysis, Human Error Analysis – Fault Tree Analysis, Emergency Response. Decision for action – purpose and considerations.

Indoor Air Quality: Asbestos Awareness - Blood-borne Pathogen.

Module-3: Fire Prevention, Protection & Electrical Safety, Product Safety **9 Hours**

Fire Prevention and Protection:

Fire triangle, Fire development and its severity, Effect of enclosures, Early detection of fire, Classification of fire and fire extinguishers.

Electrical Safety, Product Safety: Standard and Lockout/Tagout - Product Safety: Technical Requirements of Product safety - Process Safety Management. Exit Routes, Emergency Action Plans and Confined Spaces & Entry.

Module-4: Health Considerations at Work Place **9 Hours**

Health Considerations at Work Place:

Types of diseases and their spread, Health Emergency. Personal Protective Equipment (PPE) – types and advantages, effects of exposure and treatment for engineering industries, Construction site solid waste. Environment Management Plans (EMP) for safety and sustainability.

Module-5: Principles of Industrial Hygiene & Safety Considerations **9 Hours**

Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites. Policies, roles and responsibilities of workers, managers and supervisors. OSHA Record Keeping.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the relevance, development, and legal framework of Occupational Safety and Health Act.
CO2	Identify workplace health risks and PPE requirements, basic environmental management plans for safety and sustainability.
CO3	Illustrate fire prevention methods, electrical safety protocols in Construction field.
CO4	Discuss ergonomic principles and standards in Construction field, human error, emergency response strategies and indoor air quality issues.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Suggested Learning Resources:

Text Books

1) S. Reed, "Principles of Occupational Health and Hygiene", 4th ed. CRC Press, Boca Raton, FL, 2024.
2) Y. Kwak and J. Kang, "Advances in Occupational Health and Safety: Managing Risks in the Workplace". Wiley, Hoboken, NJ, 2023.
3) D. L. Goetsch, "Occupational Safety and Health for Technologists, Engineers", and Managers, 9th ed. Boston, 2020.
4) H. W. Heinrich, "Industrial Accident Prevention: A Scientific Approach". McGraw-Hill Book Company, New York, 2007.

Reference Books

1) R. Litchfield and E. Palacios, "Occupational Health and Safety: A Critical Approach". Springer, Switzerland, 2022.
2) A. Sharman, "Safety Culture: An Innovative Leadership Approach". Routledge, UK, 2017.
3) D. J. Walters, "The Occupational Health and Safety Handbook". Chichester, Wiley-Blackwell, UK, 2015.
4) M. A. Friend and J. P. Kohn, "Fundamentals of Occupational Safety and Health, 7th ed. Government Institutes", Lanham, MD, 2015.
5) D. E. Della and Giustina, "Safety and Environmental Management. Van Nostrand Reinhold International", Thomson Publishing Inc., New York, 1996.
6) D. A. Colling, "Industrial Safety Management and Technology". Prentice Hall, New Delhi, India 1990.

B.E. (Common to All Branches)
Outcome Based Education(OBE) and Choice Based Credit System(CBCS)
SEMESTER – III

Course Title:	**Social Connect and Responsibility**		
Course Code:	**BSCK307**	**CIE Marks**	**100**
L :T : P	**0:0:2**	**SEE Marks**	**-**
Credits:	**1**	**Exam Hours**	**-**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Provide a formal platform for students to communicate and connect to the surrounding.
2. Create a responsible connection with the society.
3. Understand the community in general in which they work.
4. Identify the needs and problems of the community and involve them in problem–solving.
5. Develop among themselves a sense of social &civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
6. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

General Instructions - Pedagogy:

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied social and cultural skills.
2. State the need for activities and its present relevance in the society and provide real-life examples.
3. Support and guide the students for self-planned activities.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
5. Encourage the students for group work to improve their creative and analytical skills.

Module-1 **3 Hours**

Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of BE students. (ONESTUDENT-ONE TREE).

Students can prepare either a Report or a Poster describing the plant's origin, its usage in daily life, its appearance in folklore and literature.

Module-2 **3 Hours**

Heritage walk and crafts corner

Heritage walk- Heritage tour, knowing the history and culture of the city, connecting to people around through their history.

Crafts corner- Knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms.

Module-3 **3 Hours**

Organic farming and waste management

Organic Farming: History of organic farming, objective of organic farming, types of organic farming, Usefulness of organic farming.

Waste Management: Study of wet waste management in college, Hostel and neighboring villages, and implementation in the campus.	
Module-4	**3 Hours**
Water conservation Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices.	
Module-5	**3 Hours**
Food walk City's culinary practices, food lore, and indigenous materials of the region used in cooking.	

Course outcomes

At the end of the course, the student will be able to:

CO1	Communicate and connect to the surrounding.
CO2	Create a responsible connection with the society.
CO3	Involve in the community in general in which they work.
CO4	Notice the needs and problems of the community and involve them in problem – solving.
CO5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
CO6	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**

SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Weightage	**CIE – 100%**	• Implementation strategies of the project. • The last report should be signed by SCR Coordinator, the HOD and Principal. • At last report should be evaluated by the SCR Coordinator. • Finally, the consolidated marks sheet should be sent to the CoE/ university and to be made available at LIC visit.
Field Visit, Plan, Discussion	10 Marks	
Commencement of activities and its progress	20 Marks	
Case study-based Assessment Individual performance with report	20 Marks	
Sector wise study & its consolidation 5*5=25	25 Marks	
Video based seminar for10 minutes by each student at the end of semester with Report. **Activities 1to5, 5*5=25**	25 Marks	
Total marks for the course in each semester	**100 Marks**	
For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.		
Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general through activities.		

Guideline for Assessment Process:

Continuous Internal Evaluation (CIE)

After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50. Planning and scheduling the social connect Information/Data collected during the social connect Analysis of the information/data and report writing Considering all above points allotting the marks as mentioned below:

Excellent : 80 to100
Good : 60 to79
Satisfactory : 40to59
Unsatisfactory and fail : <39

SPECIAL NOTE: NO SEMESTER END EXAM (SEE)–COMPLETELY PRACTICAL AND ACTIVITIES-BASED EVALUATION

ACTIVITIES

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSETOPICS

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversion will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

DURATION

A total of 30 - 35 hours engagement per semester is required for the3rd semester of the B.E./B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentors. Faculty mentors will design the activities (particularly Jamming sessions open mic, and poetry) Faculty mentors have to design the evaluation system as per VTU guidelines of scheme & syllabus.

PEDAGOGY–GUIDELINES

It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

Sl. No.	Topic	Group size	Location	Activity Execution	Reporting	Evaluation of the Topic
1.	**Plantation and adoption of a tree:**	May be individual or team of 5	Farmers land/ parks / Villages /roadside/ community area / College campus etc…..	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
2.	**Heritage walk and crafts corner:**	May be individual or team of 5	Temples/monumental places / 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 Faculty

3.	**Organic farming and waste management :**	May be individual or team of 5	Farmers land/parks/ Villages visits /roadside/community area / College campus etc…..	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned Evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
4.	**Water conservation :** & conservation techniques	May be individual or team of 5	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 Faculty
5.	**Food walk: Practices in society**	May be individual or team of 5	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 Faculty

Plan of Action (Execution of Activities)

Sl. NO	Practice Session Description
1	Lecture session in field to start activities
2	Students Presentation on Ideas
3	Execution of Activity - Plantation and adoption of a tree
4	Execution of Activity - Heritage walk and crafts corner
5	Execution of Activity - Organic farming and waste management
6	Execution of Activity - Water conservation
7	Execution of Activity – Food walk
8	Case study based Assessment, Individual performance
9	Sector/Team wise study and its consolidation
10	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion.
- At last consolidated report of all activities from 1st to 5th, compiled report should be submitted as per the instructions and scheme.

B.E. (Common to all Branches) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – III			
Course Title:	**Foreign Language Course 1- German**		
Course Code:	**BFLC358A**	**CIE Marks**	**50**
(L :T : P) + SL	**(1:0:0) + (15 Hours/ Sem)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**02**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. To develop basic communication skills in German.
2. To introduce German grammar and sentence structure.
3. To enhance vocabulary in everyday and academic contexts.
4. To enable students to comprehend and respond in spoken and written German.
5. To build intercultural awareness through authentic material like short films and dialogues.

Module 1	**3 Hours**
Vocabulary for day to day activities, Time – official/in official, Possessive articles, Speaking about family, Time prepositions, Worksheets, Short Film Textbook 1: Chapter 5, 6	
Module 2	**3 Hours**
Talk about hobbies, Talking about plans, Trennbare verben/separable verbs, Going to a restaurant, Worksheets, Short Film Textbook: Chapter 5, 6	
Module 3	**3 Hours**
Talking about jobs, Talking about the workplace, Helping verbs in Past tense, Attending events in your town, Worksheets, Short Film Textbook: Chapter 7,8	
Module 4	**3 Hours**
Daily routine, Body parts, Common illnesses, Visiting the doctor, Healthy living, Worksheets, Short Film Textbook: Chapter 7,8	
Module 5	**3 Hours**
Dativ Imperative, Small Talk…Worksheets, Short Film Textbook: Chapter 7,8	

Course Outcomes

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

CO1: Understand and apply basic German grammar and sentence structure.
CO2: Communicate using appropriate vocabulary and expressions in daily situations.
CO3: Fill out simple forms and conduct structured conversations.
CO4: Comprehend basic written and audio-visual content in German.
CO5: Recognize basic cultural and linguistic distinctions in German-speaking countries.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Textbooks

1. Netzwerk A1 Neu Kursbuch
2. Netzwerk A1 Neu Ubungsbuch

Web links and Video Lectures (e-Resources)

- https://www.youtube.com/playlist?list=PLquImyRfMt6esqE6C4RdOeg0h0IBeYWri
- https://www.youtube.com/playlist?list=PLWO81tQUNYnX7laegkYvzQiMrSghMXYCZ
- https://www.youtube.com/watch?v=4-eDoThe6qo
- https://learngerman.dw.com/en/wer-spricht/l-56577891/e-57119877

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Role Play
- Flipped classroom
- Debate
- Films
- Quiz
- Games
- Handouts

B.E. (Common to all Branches) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – III			
Course Title:	**Foreign Language Course 1- Spanish**		
Course Code:	**BFLC358B**	**CIE Marks**	**50**
(L :T : P) + SL	**(1:0:0) + (15 Hours/ Sem)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**02**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. To introduce learners to the basics of Spanish phonetics and vocabulary.
2. To familiarize learners with basic sentence elements such as articles, pronouns, and regular verbs.
3. To promote simple self-expression and comprehension in everyday scenarios.
4. To prepare the learners to introduce and describe a person.

Module 1	**3 Hours**
Introduction and Phonetics: • Spanish alphabet and sounds. • Numbers (0–50), days and months. • Greetings and introducing yourself. Textbook: Chapter 0 and Chapter 1 – Lesson 2	
Module 2	**3 Hours**
Nouns and Articles • Gender and number of nouns. • Definite and indefinite articles. • Simple sentence structure with nouns. Textbook: Chapter 2 – Lesson 3	
Module 3	**3 Hours**
Subject Pronouns and Regular Verbs • Subject pronouns (yo, tú, él, etc.). • Present tense of regular AR/ER/IR verbs. • Making positive and negative sentences. Textbook: Chapter 2 – Lesson 4	
Module 4	**3 Hours**
Ser vs Estar and Adjectives • Usage of 'ser' and 'estar'. • Descriptive adjectives and agreement. • Describing people and places. Textbook: Chapter 6 – Lesson 11	
Module 5	**3 Hours**
Demonstratives, Possessives, and Family • Demonstrative adjectives (este, esa, etc.). • Possessive adjectives (mí, tu, su, etc.). • Talking about family and relationships. Textbook: Chapter 4 – Lesson 7 & Lesson 8; Chapter 6 – Lesson 12	

Course Outcomes

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

CO1: Recognize and pronounce basic Spanish phonemes and vocabulary.
CO2: Use articles, nouns, subject pronouns and regular verbs in simple sentences.
CO3: Construct and understand basic descriptive sentences using 'ser' and 'estar'.
CO4: Identify and describe relationships using demonstratives and possessives.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Textbook:

1. Chicos Chicas 1
2. Resources and Exercises from Aventura Hispana

Weblinks:

- **YouTube channels:** Butterfly Spanish, Dreaming Spanish

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

- Role Play

- Debate
- Short videos
- Games
- Handouts

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title:	**Data analytics with Excel**		
Course Code:	**BCV358C**	**CIE Marks**	**50**
(L :T : P)	**(0:0:2)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Understand the use of Spreadsheet for data collection and analysis.
2. Solve the equations using Excel functions
3. Analyze the data to get the proper visualization.

Sl. No.	Experiments
1	Introduction to Data Analysis Using Spreadsheets: Fundamentals of spreadsheet applications, Excel interface, and learn how to navigate around a worksheet and workbook.
2	Using Excel Spreadsheets: Perform basic spreadsheet tasks, such as viewing, entering, editing data, moving, copying and filling data. The fundamentals of formulas and most common functions.
3	Cleaning & Wrangling Data Using Spreadsheets: Importance of data quality, how to import file data into Excel, fundamentals of data privacy, remove duplicate and inaccurate data, and how to remove empty rows.
4	Inconsistencies in data, Flash fill and Text to Columns features to help you manipulate and standardize data.
5	Analysing Data using Spreadsheets: Fundamentals of analysing data using a spreadsheet, filter and sort data.
6	Use of VLOOKUP and HLOOKUP reference functions.
7	Create pivot tables in Excel and use several pivot table features.
8	Use of charts- Bar chart, Pie, Scatter plot correlation equations.
9	Final Project – To enable students to apply the concepts of data preparation and analysis using spreadsheet tools in a practical, hands-on environment.
10	Submission of report for final assessment.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the spreadsheet and categorize the data sets.
CO2	Apply excel function to perform the calculations.
CO3	Interpret the data to give proper solutions.

ASSESSMENT DETAILS (Both CIE and SEE)

1-Credit Lab Course			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. Manisha Nigam. "Data Analysis with Excel," BPB Publications, 2019.
2. Joe Penn. "Data Analysis with Excel" Kindle Edition, 2020.

Reference books:

1. George Mount. "Modern Data Analytics in Excel" O Reilly Media, Inc. Publishers, 2024.
2. Manisha Nigam. "Advanced Analytics with Excel" BPB Publishers, 2020.

B.E. (Civil Engineering) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – III			
Course Title:	**Smart Urban Infrastructure**		
Course Code:	**BCV358D**	**CIE Marks**	**50**
(L :T : P) + SL	**(1:0:0) + (15 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Introduce the foundational concepts, global standards, infrastructure elements, stakeholders, and key trends in smart city development.
2. Explore smart urban energy and transportation systems, focusing on policies, technologies, data usage, and transition strategies.
3. Identify and explain key factors in the transition from legacy cities to smart cities, and discuss their basic managerial implications.
4. Understand innovative governance approaches and the role of city governments and stakeholders in managing smart cities.

Module-1: Introduction to Smart Urban Infrastructures and Smart Cities	**3 Hours**
Introduction to smart city, Basic concept of developing smart city, Global standards to create smart city. List of infrastructure facilities, Advantages and disadvantages. Principle stakeholders, key trends in smart cities developments.	
Module-2: Smart Urban Energy Systems	**3 Hours**
Introduction to Smart Energy Systems, Government policy and technology. Energy sector to explore some of the most important managerial considerations in the transition phase and operation of Smart Urban Energy Systems.	
Module-3: Smart Transportation Technologies	**3 Hours**
Introduction to smart transportation system, Mode of transport systems for smart city, Data collection to arrive at best transport facility. Significant opportunities and threads for legacy urban transportation systems. Managerial considerations to facilitate the transition phase, and operation of Smart Urban Transportation Systems.	
Module-4: Legacy to Smart Cities	**3 Hours**
Important factors in the transition phase of legacy cities to Smart cities and their managerial implications.	
Module-5: Managing Smart Cities	**3 Hours**
Management of Smart Cities, different approaches & conventional urban management. Case studies on Smart Cities in Karnataka.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the key concepts, standards, infrastructure components, stakeholders, and emerging trends in Smart cities.
CO2	Illustrate smart urban energy systems, relevant policies and technologies and identify key managerial considerations in their transition and operation.
CO3	Apply the knowledge of different approaches in managing smart cities.

CO4	Explain smart transportation technologies, modes & suggest appropriate smart urban transportation systems.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Suggested Learning Resources:

Text Books

1. R P Rathaliya, "Infrastructure for Smart Cities", Shree Hari Publications, 2021.
2. L. Carol Stimmel, "Building Smart Cities", CRC Press – Taylor & Francis Group, 2016.
3. Ram Kumar Mishra, C. H. Lakshmi Kumari, Sandeep Chachra and P.S. Janaki Krishna. "Smart Cities for Sustainable Development", Springer, 2022.

Reference Books

1. A. Kumar and D. S. Meshram, "Future of Cities: Planning, Infrastructure and Development", Routledge India, 2022.
2. V. K. Shukla, P. Maheshwari, P. Sharma, and S. Vyas, "Computational Intelligence in Urban Infrastructure", CRC Press, 2024.
3. P. Sharma, "Sustainable Smart Cities in India", Springer Cham, 2024.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title:	**Sustainable Building Materials**		
Course Code:	**BCV358E**	**CIE Marks**	**50**
(L :T : P) + SL	**(1:0:0) + (15 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the principles of sustainability, environmental impacts, importance and material criteria.
2. Identify various sustainable building materials, their recycling process and applications in construction.
3. Analyse UPVC and PVC differences, their recycling benefits, and asphalt's environmental impact with recycled material uses and technologies.
4. Evaluate the cost, availability, challenges, technological barriers, government policies, future trends, and emerging materials in sustainable construction.

Module-1: Introduction to Sustainable Building Materials	**3 Hours**
Definition and principles of sustainability, Sustainability goals, The environmental impact of traditional building materials, Importance of using sustainable building materials, 3R concept, Key criteria for sustainable materials.	
Module-2: Types of Sustainable Building Materials	**3 Hours**
Introduction to Sustainable Materials, Categories of sustainable building materials- Natural and renewable materials, Recycled and reclaimed materials, Low-impact industrial materials, Bio composites and New-Generation Materials.	
Module-3: Recycled Unplasticized Polyvinyl Chloride (UPVC)	**3 Hours**
Introduction to UPVC, Difference between PVC and UPVC, Recycling process, Recycling technologies, Benefits of recycling,	
Module-4: Recycled Asphalting materials	**3 Hours**
Introduction to Asphalt and its environmental Impact, Types and sources of recycled Asphalting materials, Recycling process, Recycling technologies, Benefits of recycling.	
Module-5: Challenges and Future Trends in Sustainable Building Materials	**3 Hours**
Cost, availability, challenges and technological barriers, Government policies, Future trends and Emerging materials.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the principles of sustainability and the environmental impact of traditional versus sustainable building materials.
CO2	Identify different types of sustainable materials that can be used for construction
CO3	Describe UPVC and Asphalt characteristics, and associated recycling benefits.
CO4	Evaluate cost, availability, challenges, policies, trends, and emerging materials.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Suggested Learning Resources:

Text books

1. J. M. P. Q. Delgado, “Sustainable Materials in Building Construction”, 1st ed., Cham, Switzerland: Springer, 2020.
2. B. Kondraivendhan, C. D. Modhera, and V. Matsagar, “Sustainable Building Material and Construction”, 1st ed. Cham, Switzerland: Springer, 2022.

3. C. D. N. Fernandes, I. H. S. Alves, and F. L. Cavalcante, "Building Sustainable Materials and Technologies", 18th ed. Our Knowledge, 2023.

Reference Books

1. S. Hameeda, "Sustainable Construction and Building Material". IntechOpen, 2019.
2. V. Achal and C. S. Chin, "Building Materials for Sustainable and Ecological Environment", 1st ed. Cham, Switzerland: Springer, 2021.

B.E. (Civil Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Course Title:	**Personality Development for Civil Engineers**		
Course Code:	**BCV358F**	**CIE Marks**	**50**
(L :T : P) + SL	**(1:0:0) + (15 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Develop personality development skills, presentation skills, and handle teamwork challenges in Civil Engineering field.
2. Identify the importance of critical thinking, and professional etiquette for effective personal and professional functioning.
3. Demonstrate effective leadership qualities and respond to workplace challenges in Civil Engineering sector.
4. Employ effective group discussion techniques, creativity, and basics of psychometric assessment.

Module-1: Personality Development Skills	**3 Hours**
Importance of Listening, Speaking, Reading, Writing Skills, (LSRW skills), Personality development, Personal SWOC analysis, Self-Awareness and Self-Improvement, Interpersonal & Intrapersonal Skills	
Module-2: Presentation and Team work	**3 Hours**
Non-Verbal Communication (NVC), Presentation skills, Teamwork and its important elements, understanding challenges of team work in Civil Engineering, Defining the behaviours to synchronise with team work	
Module-3: Management and Etiquette	**3 Hours**
Critical thinking & Problem solving, Prioritization and delegation, Time management, Goal Setting, Business and Professional Etiquette.	
Module-4: Leadership Skills	**3 Hours**
Qualities of a leader, Leadership challenges in Civil Engineering projects, Conflict management, Strategies of conflict management, Stress management, Importance of conflict management at Work place, Ethics and Integrity in leadership, Case studies	
Module-5: Group discussion, Creativity and Psychometry	**3 Hours**
Effective group discussion techniques, Difference between creativity & innovation, enhancing creativity in Engineering teams, Psychometric analysis, Understanding Psychometric tests and personality assessments	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Apply non-verbal communication, effective presentation techniques, and collaborative teamwork strategies to address challenges in Civil Engineering projects.

CO2	Identify the importance of critical thinking, time management, goal setting, and professional etiquette.
CO3	Exhibit leadership qualities by addressing professional challenges through effective conflict resolution, stress management, and ethical decision-making.
CO4	Demonstrate effective group discussion techniques, understanding of creativity and innovation, and application of psychometric assessments to enhance self-awareness.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Suggested Learning Resources:

Textbooks

1. B. K. Mitra, "Personality Development and Soft Skills", 2nd ed., New Delhi, India: Oxford University Press, 2016.
2. K. Ramachandra, A. B. S. Alla Bakash, and S. Nagabhushana, "Personality Development" (Bangalore University Edition), 1st ed., Mumbai, India: Himalaya Publishing House, 2019.
3. P. Yogananda, D. Carnegie, J. Allen, J. Murphy, N. Hill, and W. C. Stone, "Personality Development Books". Namaskar Books, 2023.

Reference Books

1. O. Khazan, "Me, But Better: The Science and Promise of Personality". New York, NY, USA: Simon & Schuster, Simon Element, 2025.

2. R. Moore, "Importance of Education in Personality Development". American Academic Publisher, 2023.

B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title:	**NSS-National Service Scheme**		
Course Code:	**BNSK359**	**CIE Marks**	**100**
L : T : P: SL	**0:0:0:30**	**SEE Marks**	**---**
Credits:	**0**	**Exam Hours**	**---**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Identify the needs and problems of the community and involve the problem–solving.
2. Develop among them a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
3. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Module-1
Introduction and Basic Concepts of NSS Aims and Objective of NSS. Emblem, Moto, Flag Role and Responsibility of youth in various activities of NSS
Module-2
Youth Leadership Definition of Leadership and Important components (Social, Mental, Moral and Cultural) Qualities and Characteristics of good leaders Role of Youth leadership
Module-3
Community Work through NSS Community Work: Meaning and Nature Concept of regular activities undertaking of NSS
Module-4
NSS Activity-1
Module-5
NSS Activity-2

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the motto and concepts of NSS
CO2	Develop overall personality of volunteers and make them as leaders and responsible citizens of our nation
CO3	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO4	Communicate effectively with the community and with the officials.

ASSESSMENT DETAILS (Both CIE and SEE)

Zero-credit NCMC courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods as per 24RNBE4.2, scaled to 40 marks.
Total CIE (A+B)	**100**	**40**	**CIE Evaluation is done for a maximum of 100 marks.**
• The minimum marks to be secured in CIE is 40 (40%) out of allotted 100 marks to Pass.			

Suggested Learning Resources:

Reference 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.

Web links

1. https://nss.gov.in/
2. https://pledge.mygov.in/

B.E. (Common to All Branches)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Course Title:	**Physical Education**		
Course Code:	**BPEK359**	**CIE Marks**	**100**
L: T: P: S	**0:0:1:0**	**SEE Marks**	**---**
Credits:	**---**	**Exam Hours**	**---**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Participate in the competition at regional/state / national / international levels.
4. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

Module-1 **5 Hours**

Orientation

A. Meaning and Importance of Physical Education
B. Lifestyle
C. Health & Wellness

Module-2 **5 Hours**

General Fitness & Components of Fitness

A. Meaning and Importance of Fitness
B. Warming up (Free Hand exercises)
C. Strength – Push-up / Pull-ups

Module-3 **5 Hours**

Specific games (Anyone to be selected by the student)

A. Kabaddi

a) Fundamental skills
Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.

b) Offensive Skills:
Raiding, Hand Touch, Toe Touch, Dubki, Squat Thrust

c) Defensive Skills:
Tackling, Ankle Hold, Thigh Hold, Waist Hold, Blocking, Chain Tackle

d) Other Important Skills:
Agility, Speed, Breath Control, Breath Holding

e) Rules and their interpretation and duties of the officials

B. Kho-Kho

a) Fundamental skills
Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.

b) Skills in Chasing:
Sit on the box (Parallel & Bullet toe method), Get up from the box (Proximal & Distal foot method), Give Kho (Simple, Early, Late & Judgment), Pole Turn, Pole Dive, Tapping, Rectification of foul.

c) Skills in running:
Chain Play, Ring play and Chain & Ring mixed play.

d) Game practice with application of Rules and Regulations. **e) Rules and their interpretations and duties of the officials.**

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
CO2	Familiarization of health-related Exercises, Sports for overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Zero-credit NCMC courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods as per 24RNBE4.2, scaled to 40 marks.
Total CIE (A+B)	**100**	**40**	**CIE Evaluation is done for a maximum of 100 marks.**
• The minimum marks to be secured in CIE is 40 (40%) out of allotted 100 marks to Pass.			

Suggested Learning Resources:

Textbooks

1. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
2. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata.

Reference Books

1. Saraswati Health and Physical Education Textbook
2. V.K. Sharma's Health and Physical Education

B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title:	**Yoga**		
Course Code:	**BYOK359**	**CIE Marks**	**100**
L: T: P: S	**0:0:1:0**	**SEE Marks**	**---**
Credits:	**---**	**Exam Hours**	**---**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Physical, Mental & spiritual Objectives of Yoga
2. Explain the meaning of Yoga.
3. Discuss the importance of the Yoga and its scope.
4. Describe the aims and objectives of Yoga.
5. Clarify the misconceptions on Yoga

Module-1	**5 Hours**

Orientation

a) Introduction of Yoga
b) Aim, and Objectives of Yoga,
c) Yoga, its origin, history and development.

Module-2	**5 Hours**

Yoga

a) Yoga, its meaning, definitions.
b) Brief introduction of yogic practices for the common man
c) Rules and regulations
d) Misconceptions of Yoga
e) Surya Namaskar

Module-3	**5 Hours**

Asanas

Types of Asanas:

a)	**Sitting-**	1. Padmasana,	2. Vajrasana
b)	**Standing-**	1. Vrikshana,	2. Trikonasana
c)	**Prone line-**	1. Bhujangasana	2. Shalabh asana
d)	**Supine line-**	1. Utthita dvipadasana	2. Ardha halasana

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Yoga
CO2	Improves of health and related aspects, overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Zero-credit NCMC courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods as per 24RNBE4.2, scaled to 40 marks.
Total CIE (A+B)	**100**	**40**	**CIE Evaluation is done for a maximum of 100 marks.**
• The minimum marks to be secured in CIE is 40 (40%) out of allotted 100 marks to Pass.			

Suggested Learning Resources:

Textbooks

1. The Yoga Sutras of Patanjali – Sri Swami Satchidananda.
2. Light on Yoga — B.K.S Iyengar.

Reference Books

1. The Heart of Yoga — T.K.V Desikachar.
2. "Asana Pranayama Mudra Bandha" by Swami Satyananda Saraswati.

IV SEMESTER SUBJECTS

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Analysis of Structures**		
Course Code:	**BCV401**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:2:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**4**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Describe the concepts of deflection, slope, elastic curve, and strain energy principles with their applications in structural analysis.
2. Calculate the slope and deflection of beams and frames using analytical methods such as Macaulay's Method, Moment Area Method, Conjugate Beam Method, and the Strain Energy Principle.
3. Assess the structural performance of arches, cables, and trusses under various loading conditions.
4. Utilize classical and matrix methods such as slope deflection and Kani's method to analyze indeterminate structures.

Module–1: Analysis of Determinate Beams by Macaulay's Method and Moment Area Method **9 Hours**

Macaulay's Method: Introduction, Definitions — Slope, Deflection, Elastic Curve; Expression for the Equation of Flexure (No derivations), Sign Convention. Determination of Slope and Deflection for Prismatic Beams — Simply Supported Beams, Cantilever Beams, and Overhanging Beams subjected to Point Loads, Uniformly Distributed Loads (UDL), and Couples.

Moment Area Method: Mohr's Theorems (No derivations), Analysis of Slope and Deflection for Prismatic and Non-Prismatic Beams — Simply Supported Beams, Cantilever Beams, and Overhanging Beams subjected to Point Loads and UDL.

Module–2: Analysis of Determinate Structures by Conjugate Beam Method and Strain Energy Method **9 Hours**

Conjugate Beam Method: Concepts of Real Beam and Conjugate Beam, Conjugate Beam Theorems (No Derivations). Analysis of Slope and Deflection for Prismatic and Non-Prismatic Beams — Simply Supported Beams, Cantilever Beams, and Overhanging Beams subjected to Point Loads and UDL.

Strain Energy Method: Principle of Virtual Displacements, Principle of Virtual Forces, Strain Energy and Complementary Energy. Strain Energy due to Axial Force, Bending, Shear, and Torsion (No Derivations). Castigliano's Theorems (No Derivations). Analysis of Deflection for Simply Supported Beams, Cantilever Beams, Overhanging Beams, and Orthogonal Frames using Castigliano's Theorem.

Module– 3: Arches and Cables **9 Hours**

Arches: Concepts of normal thrust, radial shear and bending moment. Three-hinged Circular and Parabolic arches with support at the same and different levels.

Cables: Analysis of cables under point loads and UDL, Length of cables with supports at the same and different levels, Analysis of stiffening trusses for suspension cables.

Module–4: Analysis of Indeterminate Structures–Slope Deflection Method and Kani's Method **9 Hours**

Slope Deflection Method: Introduction, Analysis of continuous beams with and without support settlement, Analysis of orthogonal rigid plane frames with and without sway having kinematic indeterminacy ≤ 3. **Kani's Method:** Introduction, Analysis of frames with and without sway, Analysis of symmetric frames.
Module–5: Analysis of Indeterminate Structures – Matrix Methods of Structural Analysis **9 Hours**
Introduction: Comparison of Stiffness and Flexibility matrix methods. **Stiffness Method (System Approach)**: Analysis of continuous beams, simple orthogonal frames with kinematic indeterminacy ≤ 3, and Analysis of plane trusses.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of deflection, slope, strain energy, and methods to evaluate determinate and indeterminate structures under various loads.
CO2	Determine the slope and deflection of beams and frames, applying analytical techniques to assess structural behaviour under various loading conditions
CO3	Analyze internal forces in arches, cables, and suspension structures subjected to different loadings.
CO4	Assess continuous and indeterminate structural elements using slope-deflection, Kani's, and matrix methods for structural performance evaluation.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**

CIE + SEE **(A+B+C)**	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Suggested Learning Resources:

Textbooks

1. S. S. Bhavikatti, "Structural Analysis – Vol. 1," 6th ed., Vikas Publishing House, 2016.
2. S. S. Bhavikatti, "Structural Analysis – Vol. 2," 4th ed., Vikas Publishing House, 2017.
3. S. Ramamrutham, and R. Narayanan, "Theory of Structures," 18th ed., Dhanpat Rai Publishing Company, 2014.
4. H. S. Vishwanath and N. Dharmesh, "Analysis of Determinate Structures," 1st ed., Sapna Book House, Bengaluru, 2020.
5. H. S. Vishwanath and N. Dharmesh, "Analysis of Indeterminate Structures," 1st ed., Sapna Book House, Bengaluru, 2020.

Reference Books

1. W. Weaver and J. M. Gere, "Matrix analysis of framed structures (Reprint ed.)," CBS Publishers and Distributors Pvt. Ltd., 2018.
2. R. C. Hibbeler, "Structural analysis in SI Units," 9th ed., Pearson Education, London, 2017.
3. A. Kassimali, "Structural analysis," 5th ed., Cengage Learning- Engineering, 2014.
4. C. S. Reddy, "Basic Structural Analysis," 3rd ed., Tata McGraw Hill Education, 2010.
5. B. C. Punmia, A. K. Jain and A. K. Jain, "Theory of Structures," 20th ed., Laxmi Publications, 2017.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System(CBCS) SEMESTER – IV			
Course Title:	**Fluid Mechanics and Hydraulic Machines**		
Course Code:	**BCV402**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:2) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**4**	**Exam Hours**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the Fundamentals of Properties of fluids pressure measurement and hydrostatic law
2. Principles of Kinematics, hydrodynamics and its applications
3. Study the flow Measurement's and design of pipes
4. Apply fluid mechanics principles to the design, analysis, and management of water-related systems, including water supply, irrigation, drainage, and hydraulic structures.

Module – 1: Fluid Mechanics, Fluid Pressure Measurement and Hydrostatics **9 Hours**

Fluid Mechanics: Definition- Basics of Fluid properties. Newton's law of viscosity, Classification of fluids, applications of Surface tension and Capillarity.

Fluid Pressure and measurement–Different types of Pressures, Pascal's Law and Hydrostatic Law, Manometers– Piezometer, U-Tube and Differential U-Tube manometers (No single column monometers), Types of Mechanical Pressure gauges.

Hydrostatics: Total pressure and Centre of pressure on plane vertical, inclined surfaces.

Module – 2: Fluid Kinematics and Dynamics **9 Hours**

Fluid Kinematics- Definition, Classification of fluid flow, Principle of Conservation of Mass - Continuity equation in Cartesian coordinates and One-Dimensional flow. Stream line and stream function

Fluid Dynamics- Equations of motion, Euler's equation and Bernoulli's equation of motion– Introduction to Flow Measurement devices- Venturimeter, Notches and Weirs, Introduction to Pitot tubes and its types.

Module – 3: Flow Through Pipes **9 Hours**

Flow through Pipes: Introduction, Losses in pipe flow- Derivation of expressions for Major loss of energy due to friction. Minor Losses- Equations for Sudden contraction and sudden expansion in pipe system. Pipes in series - Compound pipe and Equivalent pipe, Pipes in parallel, Branched pipes. Concept of Hydraulic Gradient Line and Total Energy Line. Water hammer effect.

Module – 4: Open channel Flow **9 Hours**

Open Channel Flow: Introduction, Types of open channels, Uniform flow in channels - Chezy's formula, Manning's formula. Most economical channel sections- Rectangular, Triangular and Trapezoidal sections, Concepts of Specific energy & Critical flow- Specific energy curve, Rapidly Varied Flow (RVF), Hydraulic jump in rectangular channels.

Module – 5: Turbines and Pumps **9 Hours**

Impact of jet on vanes: Introduction, Impulse-Momentum equation. Direct impact of a jet on stationary and moving curved vanes, Introduction to concept of velocity triangles

Hydraulic Machines: Pelton, Kaplan-Working principles, Construction, Performance characteristics, Specific speed, Head, and Discharge considerations.

Pumps: Centrifugal, Reciprocating, principles, Construction, Performance characteristics,

Hydropower: Hydroelectric power plants, layout, and features, Selection of turbines based on head and discharge

PRACTICAL COMPONENT OF IPCC

Sl. No.	Experiments
1	Verification of Bernoulli's equation
2	Calibration of Venturimeter
3	Calibration of Orifice meter
4	Calibration of triangular notch
5	Calibration of Rectangular notch
6	Determination of hydraulic coefficients of small vertical orifice
7	Determination of major losses in pipes
8	Determination of efficiency of jet on flat and curved vanes
7	Demonstration on efficiency of centrifugal pump
9	Demonstration on efficiency of Francis/Kaplan turbine
10	Demonstration on efficiency of Pelton wheel

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental principles of fluids Mechanics
CO2	Apply principles of fluid kinematics and dynamics for flow measurements
CO3	Analyze characteristics of flow through pipes and channels
CO4	Evaluate the efficiency of hydraulic machineries.

ASSESSMENT DETAILS (Both CIE and SEE)

4-Credit Lab Integrated Theory Courses (IPCC)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.

Total CIE Practical (C)	**20**	**8**	**Marks of Experiments, Record and Test awarded for a maximum of 20 marks.**
CIE: Theory + Practical (A + B + C)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (D)	**50**	**18**	**SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE+SEE (A+B+C+D)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B, C and D**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only			

Suggested Learning Resources:

Text Books

1. P. N. Modi and S. M. Seth, **"**Hydraulics and Fluid Mechanics", 22nd ed., Standard Book House, 2019.
2. R. K. Bansal, "Fluid Mechanics and Hydraulic Machines", 11th ed., Laxmi Publications, 2019.
3. C. S. P. Ojha, P. N. Chandramouli, and R. Berndtsson, **"**Fluid Mechanics and Machinery", Oxford University Press, 2010.
4. A. Yunus Çengel and M. John Cimbala, "Fluid Mechanics fundamental and applications", 3rd ed., McGraw-Hill, 2013.
5. M. Frank White, "Fluid Mechanics", 7th ed., McGraw-Hill, 2011.

Reference Books

1. K. Subramanya, "Fluid Mechanics", Tata McGraw Hill, 2019.
2. L. Victor Streeter, E. Benjamin Wylie and W. Keith Bedford, "Fluid Mechanics", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2008.
3. S. K. SOM and G. Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi, 2020.

B.E. (Civil Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Course Title:	**Concrete Technology**		
Course Code:	**BCV403**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:2) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**4**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Analyze the properties of fresh and hardened concrete using standard test methods.
2. Design concrete mixes with and without admixtures to achieve the desired mechanical properties.
3. Evaluate concrete durability using destructive and non-destructive testing methods as per standard guidelines.
4. Justify the selection of an appropriate type of concrete for specific applications based on performance requirements and industry standards.

Module – 1: Fresh Concrete **9 Hours**

Composition and Workability of Fresh Concrete: Ingredients of concrete, Hydration and Bogue's compound, Effects on concrete, Concept of water-cement ratio.
Properties of fresh concrete, Workability - Factor affecting workability, Slump - Abrams Cone Test, Compaction factor and Vee-Bee Consistometer tests, flow tests.
Manufacturing Process and Admixtures in Concrete: Batching, Mixing, Transporting, Placing and Compaction and Curing by different methods of curing. Admixtures – Chemical and Mineral admixtures. Good and Bad practices of making and using fresh concrete.

Module – 2: Concrete Mix Design **9 Hours**

Mix design: Concept of Mix Design with and without admixtures (M25 – M40), Parameters and factors influencing mix design, Variables in proportioning and Exposure conditions, mix proportioning using IS - 10262:2019 guidelines. Numerical problems on Design mix of conventional concrete.
Ready Mix Concrete - Manufacture and requirement as per QCI-RMCPCS, Properties, Advantages, and Disadvantages.

Module – 3: Hardened Concrete **9 Hours**

Strength characteristics: Factors influencing strength of concrete, Importance of Strength development with age, Maturity concept, Effect of Water - Cement ratio on concrete strength.
Testing of hardened concrete: Destructive & Non-destructive testing, Relation between compressive and tensile strength, Flexural strength, Modulus of Elasticity of concrete.

Module – 4: Durable Concrete **9 Hours**

Durability – Definition, Significance of Durability, Internal and External factors influencing durability. Durability requirements as per IS: 456-2000.Creep - factors affecting creep, Shrinkage of concrete - Types of Shrinkage in Concrete, Factors affecting shrinkage of concrete.
Advanced concrete: High-Strength Concrete & High-Performance Concrete – Properties and Applications.

Module – 5: Special Concrete **9 Hours**

Modified concrete: Self-Compacting Concrete – Materials, Tests, Properties, Advantages, Disadvantages, Applications. Fiber Reinforced Concrete – Materials, Necessity, Types of Fibers, Properties, and Applications.
Lightweight Concrete – Materials, Types (Foamed, Aerated Autoclave), Properties, Advantages, Disadvantages, Applications.

Practical Component of IPCC

Tests on Cement (3 slots)

1. **Determination of the density of cement relative to water** – *IS 4031 (Part 11):1988* – Methods of Physical Tests for Hydraulic Cement - Determination of Density
2. **Determination of the surface area of cement particles** – *IS 4031 (Part 2):1999* – Determination of Fineness by Blaine's Air Permeability Method
3. **Determination of the standard water requirement for cement paste** – *IS 4031 (Part 4):1988* – Determination of Consistency of Standard Cement Paste
4. **Determination of the initial and final setting times of cement** – *IS 4031 (Part 5):1988* – Determination of Initial and Final Setting Time
5. **Determination of grade of cement** – *IS 4031 (Part 6):1988* – Compressive Strength of Hydraulic Cement Mortar

Tests on Fresh Concrete (2 slots)

1. **Determination of workability, consistency, and flow ability** – *IS 1199:2018* – Methods of Sampling and Analysis of Concrete
2. **Determination of the degree of compaction** – *IS 1199:2018* – Compaction Factor Test

Tests on Hardened Concrete (3 slots)

1. **Determination of the Compressive Strength of concrete** – *IS 516 (Part 1):2021* – Compressive Strength of Hardened Concrete
2. **Determination of the tensile strength and cracking resistance of concrete (Split Tensile Strength Test)** – *IS 5816:1999* – Splitting Tensile Strength of Concrete
3. **Determination of the bending resistance of concrete (Flexural Strength Test)** – *IS 516 (Part 2):2021* – Determination of Flexural Strength of Concrete
4. **Determination of the density, strength of autoclaved aerated concrete** – *IS 2185 (Part 3):1984* – Autoclaved Cellular Concrete Blocks
5. **Determination of the compressive strength and durability of concrete blocks** – *IS 2185 (Part 1):2005* – Concrete Masonry Units – Specification

Tests on Self-Compacting Concrete (3slots)

1. **Determination of the flow ability, viscosity, and horizontal spread (Slump Flow Test and T50 Test)** – *IS 1199 (Part 6):2018* – Slump Flow Test for Self-Compacting Concrete
2. **Determination of the passing ability through reinforcement (L-Box and J-Ring Test)** – *IS 1199 (Part 6):2018* – Passing Ability of Self-Compacting Concrete
3. **Determination of the filling ability and flow resistance (U-Box and V-Funnel Test)** – *IS 1199 (Part 6):2018* – Filling Ability and Flow ability of Self-Compacting Concrete

4. **Determination of the segregation resistance, stability, and uniformity** – *IS 1199 (Part 6):2018* – Segregation Resistance of Self-Compacting Concrete

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of fresh concrete, including its composition, properties, workability tests, manufacturing processes, and admixtures.
CO2	Apply concrete mix design principles and relevant IS codes to proportion concrete mixes for various grades and exposure conditions, including ready mix concrete.
CO3	Analyze the strength and durability characteristics of hardened concrete using destructive and non-destructive testing methods.
CO4	Evaluate the performance and suitability of conventional and special concretes through relevant laboratory tests.

ASSESSMENT DETAILS (Both CIE and SEE)

4-Credit Lab Integrated Theory Courses (IPCC)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	**20**	**8**	**Marks of Experiments, Record and Test awarded for a maximum of 20 marks.**
CIE: Theory + Practical (A + B + C)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (D)	**50**	**18**	**SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE+SEE (A+B+C+D)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B, C and D**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only

Suggested Learning Resources:

Textbooks:

1. M. Neville, Properties of Concrete, 4th ed., London, U.K.: Longman, 1995.
2. M. S. Shetty, Concrete Technology: Theory and Practice, New Delhi, India: S. Chand & Company, 2005.
3. P. K. Mehta and P. J. M. Monteiro, Concrete: Microstructure, Properties, and Materials, 4th ed., New York, NY, USA: McGraw Hill Education, 2014.
4. R. Santha Kumar, Concrete Technology, New Delhi, India: Oxford University Press.
5. M. L. Gambhir, Concrete Technology, 5th ed., New Delhi, India: Tata McGraw-Hill Publishing Company, 2017.

Reference Books / Codes

1. S. H. Kosmatka, B. Kerkhoff, and W. C. Panarese, Design and Control of Concrete Mixtures, 16th ed., Skokie, IL, USA: Portland cement Association, 2011.
2. M. Neville and J. J. Brooks, Concrete Technology, 2nd ed. Harlow, U.K.: Pearson Education, 2010.
3. S. Mindess, J. F. Young, and D. Darwin, Concrete, 2nd ed. Upper Saddle River, NJ, USA: Prentice Hall, 2002.
4. M. L. Gambhir, Concrete Manual: Lab Manual for Quality Control of Concrete. New Delhi, India: Dhanpat Rai & Co., 2009.
5. Bureau of Indian Standards, IS 456: Plain and Reinforced Concrete – Code of Practice, New Delhi, India: BIS, 2000, reaffirmed 2005.
6. Bureau of Indian Standards, IS 10262: Indian Standard Concrete Mix Proportioning – Guidelines, 2nd rev., New Delhi, India: BIS, 2019.
7. Bureau of Indian Standards, IS 516: Methods of Tests for Strength of Concrete, New Delhi, India: BIS, 1959.

B.E. (Civil Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Course Title:	**Computer Aided Building Planning and Drawing**		
Course Code:	**BCVL404**	**CIE Marks**	**50**
(L :T : P)	**0:0:2**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the basics of technical drawing, including scales, line types, dimensions, and conventional representations.
2. Develop proficiency in using drawing and modification tools for creating and editing CAD drawings.
3. Apply building planning principles and building bye-laws to design layouts and floor plans.
4. Prepare detailed working drawings, including elevations, sections, and service layouts, for various types of buildings.

Sl. No.	Experiments
1	**Drawing Basics**: Selection of scales for various drawings, thickness of lines, Units and dimensions, abbreviations and conventional representations.
2	**Drawing Tools**: Lines Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse.
3	**Modify tools**: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet.
4	**Using Text**: Single line text, Multiline text, Spelling, Edit text.
5	**Special Features**: View tools, Layers concept, Dimension tools, Hatching, Customizing Toolbars, Working with multiple drawings.
6	**Building Planning**: Principles of Building Planning, Classification of buildings and Building by-laws as per National building Code (NBC).
7	**Building drawing:** Universal signs and symbols, line types, scale, building elements; Building floor plans, elevations, sections and site plan, Printing and plotting.
8	**Development of Plan, Elevation, section and Schedule of Openings for the following:** Single Storey and Two Storey residential building, Hostel Building and primary health centre. (With or without line diagram)
9	**Electrical, plumbing and sanitary layout drawings**.
10	**Prepare working drawing of components of building** like Substructure - types of foundation, footing layouts, marking drawings.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental principles of drawings and its tools.
CO2	Apply the knowledge of drawing tools to prepare Civil Engineering drawings.
CO3	Develop building plans as per National Building Code.
CO4	Create comprehensive working drawings, including elevations, sections, service layouts, for residential, Hostel Building and primary health centre.

ASSESSMENT DETAILS (Both CIE and SEE)

1-Credit Lab Course			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. R. S. Malik and G. S. Meo, "Civil Engineering Drawing", 5th ed., Computech Publication Pvt Ltd., 2023.
2. S. S. Bhavikatti and M.V. Chitawadagi, "Building Planning and Drawing", 1st ed., I K International Publishing House Pvt. Ltd., 2014.

Reference Books

1. M. G. Shah, C. M. Kale and S. Y. Patki, "Building drawing with an integrated approach to build environment", 6th ed., Tata McGraw Hill, 2019

2. Gurucharan Singh, "Building Construction", 17th ed., Standard Publishers, & distributors, New Delhi, 2020.
3. National Building Code of India, 2016 (NBC 2016).

B.E. (Civil Engineering)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Course Title:	**Watershed Management**		
Course Code:	**BCV405A**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**3**	**Exam Hours**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. To understand Watershed Hydrology.
2. To estimate water demand and learn, water conservation methods.
3. To understand application of Remote Sensing and GIS in watershed management.
4. Sustainable measures for watershed management.

Module-1: **9 Hours**

Principles of Watershed Management: Basics concepts, hydrology and water availability, surface water, ground water, conjunctive use, human influences in the water resources system.

Module-2: **9 Hours**

Water resources systems: Integrated water resources system, river basins- morphometric analysis of watersheds for watershed management, watershed management practices in arid and semi-arid regions, watershed management through wells, management of water supply, short term and long-term strategic planning.

Module-3: **9 Hours**

Conservation of Water: Perspective on recycle and reuse, wastewater reclamation, social aspects of watershed management and community participation, private sector participation, institutional issues, socio-economy, integrated development, water legislation and implementations, case studies.

Water Harvesting: Rainwater management, conservation, storage and effective utilization of rainwater, structures for rainwater harvesting, roof catchments system, check dams, aquifer storage.

Module-4: **9 Hours**

Sustainable Watershed Approach: Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, soil erosion and conservation.

Module-5: **9 Hours**

Applications of RS and GIS in Watershed management: Role of decision support system in watershed management, watershed characteristics of coastal regions, coastal aquifer tor management, uniqueness of coastal water resources.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental principles of watershed management and analyze the influence of surface water, groundwater, and human activities on water resource systems.
CO2	Identify key components of integrated water resources systems and explain watershed management strategies suitable for arid and semi-arid regions.
CO3	Describe the methods for water conservation, recycling, and harvesting, and discuss the socio-economic, institutional, and legislative aspects of watershed management.

CO4	Explain sustainable watershed approaches, and how remote sensing and GIS tools assist in watershed planning, especially in coastal areas.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Suggested Learning Resources:

Text Books

1. J. V. S. Murthy, "Watershed Management", New Age International, New Delhi, India, 2020.
2. P. L. Maliwal, "Textbook of Rain fed Agriculture and Watershed Management". Scientific Publishers, Jodhpur, India, 2022.
3. S. Anbazhagan, S. K. Subramanian, and X. J. De La Rosa, "Geoinformatics in Applied Geomorphology", Springer, Singapore, 2022.

Reference Books

1. R. Suresh, "Soil and Water Conservation Engineering", Standard Publishers Distributors, New Delhi, India, 2023.
2. J. V. S. Murthy, "Watershed Management in India", New Age Publishers, 2nd ed., New Delhi, 2017.
3. Singh Vir and Raj, "Watershed Planning and Management", 3rd Revised ed., Yash Publishing House, Bikaner, 2016.
4. "Decision Support System for Integrated Watershed Management", Colorado State University. 2012.
5. S. K. Gupta and I. C. Gupta, "Management of Water Resources for Sustainable Agriculture", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India, 2008.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Construction Equipment, Plants and Machinery**		
Course Code:	**BCV405B**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**3**	**Exam Hours**	**03**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. To provide insight on the different functions and operations of different equipment and techniques during construction.
2. To impart knowledge on the various maintenance and safety to be considered during construction
3. To acquire knowledge on the life cycle of construction equipment.
4. To adopt mechanization in the construction industry.

Module-1: Earth Moving Equipment and Machinery **9 Hours**

Earth moving equipment: Power shovels, Loader, Dragline, Clam shell, Bulldozer, Grader.

Earth excavation equipment: Excavators, Backhoes, Trenchers, Scraper.

Earth compacting equipment: Smooth wheel and Sheep-foot roller, Vibrio compacting roller, Pneumatic type rollers, Compacting and Paving technology.

Module-2: Construction Equipment **9 Hours**

Hoisting equipment: Hoist winch, Hoisting chains, Hooks and Slings.

Types of cranes: Tower crane, Mobile crane and Derric crane. Performance and safety in operation.

Hauling Equipment: Transit mixers and Dumpers.

Conveying Equipment: Belt conveyors, Screw conveyor, and Bucket conveyor.

Module-3: Equipment for Production of Aggregate, Concreting and Highway Constructions **9 Hours**

Aggregate Production Equipment: Crushers, Feeders, Screening Equipment & Handling Equipment.

Concrete Production Equipment: Concrete mixers, Truck mixers, Pneumatic concrete placer, Concrete vibrators, Batching and Mixing equipment, Hauling, Pouring and Pumping equipment, Transporters.

Highway Constructions Equipment: Introduction and classification to Hot mix plant process of asphalt, PQC Paver- Classification & Components

Module-4: Tunnelling Equipment and Piling Equipment **9 Hours**

Tunnelling Equipment/Piling Equipment: Introduction to Tunnel Boring Machines (TBM), Details and operation of a hard-rock TBM, Details of Earth Pressure Balance (EPB) TBM, Details and operation of Slurry TBM & Components, Hydraulic Grabs, Piling Rig, Pile Drivers.

Module-5: Mechanization and Digitalization in Construction and Safety in Construction Equipment **9 Hours**

Mechanization and Digitalization: Importance of digitalization - Digital Solution in Construction Projects- Importance of Mechanization - Railway Track Construction- Rebar Processing Machine-

Operation of Mechanized Equipment- Introduction to 3D Concrete Printer- Importance of Safety- Various & Purpose- Safety of Men & Machines at Work- Safety During Construction Activities Safety with Tools & Tackles.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the functions and limitations of earth excavation, earth moving and compacting equipment used in construction projects.
CO2	Illustrate the performance and safety aspects of equipment used in hoisting, hauling, and conveying in construction operations.
CO3	Describe the applications of equipment used for aggregate production, concreting, highway construction, Tunnel Boring Machines (TBMs), hydraulic grabs, and piling rigs in construction tasks.
CO4	Explain the mechanization and digitalization in construction, 3D concrete printers.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Suggested Learning Resources:

Text Books

1. S. C. Sharma, "Construction Equipment and Its Management", 6th ed., Khanna Publishers, New Delhi, 2020.
2. R. Peurifoy, C. Schexnayder, A. Shapira, and R. Schmitt, "Construction Planning, Equipment, and Methods", 9th ed., McGraw-Hill, New York, 2018.
3. M. P. Barney, "Heavy Construction Equipment Technology". Pearson Publication, Boston, 2018.

Reference Books

1. R. K. Jain, "Construction Plant and Equipment". Khanna Publishers, New Delhi, India, 2014.
2. S. W. Nunnally, "Construction Methods and Management", 8th ed. Prentice Hall, Upper Saddle River, NJ, 2011.
3. A. C. A. Iyer, "Introduction to Construction Equipment". Prentice-Hall India, New Delhi, India, 2011.
4. D. D. Gransberg, C. M. Popescu, and R. C. Ryan, "Construction Equipment Management for Engineers", Estimators, and Owners, 2nd ed. CRC Press, Boca Raton, FL, 2006.
5. F. Harris, "Modern Construction and Ground Engineering Equipment and Methods", 2nd ed. Pearson Longman, Harlow, UK, 1994.
6. D. A. Day and N. B. H. Benjamin, "Construction Equipment Guide", 2nd ed. John Wiley & Sons, New York, 1991.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Energy Efficiency, Acoustics, and Daylighting in Buildings**		
Course Code:	**BCV405C**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**3**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the influence of environmental factors—including thermal, visual, and acoustic parameters—on building design and human comfort.
2. Analyze the thermal performance of buildings with respect to heat exchange processes, material properties, and natural ventilation strategies to enhance energy efficiency.
3. Apply principles of acoustics and daylighting to design building elements such as fenestration, shading devices, and insulation systems for improved indoor environmental quality.

MODULE – 1: Environmental Factors	**9 Hours**
Factors and their representation, tropical environments, and site environments, Human response to environment: Factors affecting human comfort, Human response to thermal environment, noise, visual environment Comfort indices.	
MODULE – 2: Response of building to thermal environment:	**9 Hours**
Processes of heat exchange of building with environment; Effect of solar radiation; Thermal properties of material and sections and their influence, Steady and periodic heat transfer in buildings. Representation using radiant rose diagram.	
MODULE – 3: Structural control and design for energy efficiency	**9 Hours**
Selection of envelope elements, Orientations, shape, Glasses, and shading devices. Natural ventilation, Purpose of ventilation, Mechanisms, Fenestration Design for natural ventilation. Basic characteristics of lighting.	
MODULE – 4: Noise and Building	**9 Hours**
Basic acoustics and noise, Planning, Sound in free field, protection against external noise, Internal noise sources and protection against air borne & structure borne noise.	
MODULE – 5: Day lighting:	**9 Hours**
Lighting principles and fundamentals Sky, Indian sky, daylight prediction and design of fenestration. Recommended Lighting Levels for Residential and Office Spaces.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the influence of thermal, visual, and acoustic environmental factors on human comfort and their role in building design.
CO2	Analyze the heat exchange processes and thermal properties of materials, and apply natural ventilation techniques to enhance the energy efficiency of buildings.
CO3	Design building elements such as fenestration, shading devices, and insulation systems using principles of acoustics and daylighting to improve indoor environmental quality.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. • **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**			

Suggested Learning Resources:

Text Books

1. T. A. Markus and E. N. Morris, “Building Climate and Energy”, Pitman Publishing Limited, 1980.
2. J. D. Croome and B. M. Roberts, “Air Conditioning and Ventilation of Buildings”, vol. 1, Pergamon Press, 1981.
3. J. D. Croome, Noise, “Building and People”, Pergamon Press, 1977.

Reference Books

1. Bureau of Indian Standards, “Handbook of Functional Requirements of Buildings” (SP-41 & SP-32), BIS, 1987 and 1989.

2. O. H. Koenigsberger et al., “Manual of Tropical Housing and Building – Part I: Climatic Design”, Orient Longman, 1973.
3. Z. Maekawa and P. Lord, “Environmental and Architectural Acoustics”, 2nd ed., CRC Press, 1994.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Air Pollution and Monitoring**		
Course Code:	**BCV405D**	**CIE Marks**	**50**
(L :T : P) + SL	**(3:0:0) + (45 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**3**	**Exam Hours**	**3**

Course Learning Objectives:

The purpose of the course is to enable the learner to:

1. Analyze sources of air pollution and evaluate their effects on the environment and human health.
2. Understand the meteorological factors that influence the formation and spread of air pollution.
3. Illustrate particulate and gaseous pollution control methods.

Module – 1: Fundamentals of Air Pollution	**9 Hours**
Introduction: Definition, Sources, Classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Types of inversion, photochemical smog.	
Module – 2: Meteorological Parameters in Pollution Dispersion	**9 Hours**
Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behaviour, measurement of meteorological variables, plume rise, estimation of effective stack height and mixing depths.	
Module – 3: Techniques in Air Quality Monitoring and Modelling	**9 Hours**
Sampling: Sampling of particulate and gaseous pollutants (stack, ambient & indoor air pollution), monitoring and analysis of air pollutants (PM2.5, PM10, SOx, NOx, CO, NH3). Air sampler and its applications. Development of air quality models-Gaussian dispersion model-numerical problems.	
Module – 4: Air Pollution Control Techniques	**9 Hours**
Control techniques: Particulate matter and gaseous pollutants- settling chambers, cyclone separators, scrubbers, filters & electrostatic precipitator - numerical problems. Wind rose diagrams and its application. Site selection criteria for industrial plant.	
Module – 5: Automobile and Noise Pollution: Impacts and Regulations	**9 Hours**
Air pollution due to automobiles, standards and control methods. Noise pollution- causes, effects and control, noise standards. Environmental issues, global episodes. Environmental laws and acts.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the sources, types, and effects of air pollutants along with atmospheric phenomena of inversion and smog.
CO2	Assess pollutant dispersion and estimate effective stack height and mixing depth.
CO3	Analyze dispersion models to predict pollutant concentrations.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. • **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**			

Suggested Learning Resources:

Textbooks

1. M. N. Rao and H V N Rao, "Air Pollution", 26th ed., Tata Mc-Graw Hill Publication, 2007.
2. H. C. Perkins, "Air Pollution", Tata Mc-Graw Hill Publication.
3. Mackenzie Davis and David Cornwell, "Introduction to Environmental Engineering", 5th ed., Tata Mc-Graw Hill Publication, 2015.
4. Anjaneyulu Yerramilli, "Air Pollution and Control Technologies", 2nd ed., Allied Publishers, 2019.

References Books

1. Noel De Nevers, "Air Pollution Control Engineering", Waveland PR Inc., 2015.
2. W.L. Heumann, "Industrial Air Pollution Control Systems", McGraw-Hill.

3. Peavy S.W., Rowe D.R. and Tchobanoglous G, “Environmental Engineering”, McGraw-Hill, 2015.
4. Mahajan S.P, “Pollution Control in Process Industries”, Tata McGraw-Hill Publishing Company.
5. S. K. Garg, “Environmental Engineering- Sewage Waste Disposal and Air Pollution Engineering”, 46th ed., vol. II, Khanna Publishers, 2024.

B.E. (Common to All branches)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Course Title:	**Finance and Accounting**		
Course Code:	**BFAT456A**	**CIE Marks**	**50**
(L: T: P) + S	**(1:0:0) + (15 Hours / Sem)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

1. To enable the students to understand the conceptual framework of accounting, reporting and financial statements.
2. To enable the students in understanding of books of accounts and accounting records leading to final accounts and interpretation there-off.
3. To acquaint the students with the concepts of Time value of Money for decision making.

Module-1 **3 Hours**

Introduction to Accounting: Meaning and objectives, Branches of Accounting, GAAP, IAS, IFRS, Concepts and Conventions, Users of accounting, accounting terminologies. (Only Theory)
Self-Learning Activity: Self-exploration exercise where students write about their understanding of Golden rules of Accounting, Classification of Assets and Liabilities.
Students can Compare GAAP, IAS, and IFRS side by side on Origin, purpose, scope, key differences.
Textbook 1: Section 1; Chapter 1, 2 and 3

Module-2 **3 Hours**

Journal, Ledgers, Trial balance, accounting equation, subsidiary books and final accounts (Only theory)
Self-Learning Activity: Students will write the liquidity and Profitability status by reading the financial statements of a Company.
Textbook 1: Section 1; Chapter 4, 5, 6 and 8

Module-3 **2 Hours**

Emerging accounting Practices: Window dressing, forensic accounting, Green Accounting, Human resource accounting and sustainability reporting.
Self-Learning Activity: Students will understand the significance of human resources accounting in the corporate environment.
Textbook 2: Chapter 6

Module-4 **3 Hours**

Overview of Financial Management: Meaning and scope- objectives of Financial Management-Functions of Finance-Role and functions of finance managers.
Indian Financial System: Structure-types-Financial markets- Financial Instruments -Financial institutions and financial services- Non-Banking Financial Companies (NBFCs).
(Theory only)
Self-Learning Activity: Students will have to understand the classification of Banking industry and write the functions of Banking and Non -banking Organizations.
Textbook 3: Part 1; Chapter 1 and 2

Module-5 **4 Hours**

Emerging areas in Financial Management: Risk Management- Behavioral Finance- Financial Engineering- Derivatives (Theory).
Time Value of Money: Time value of money –Future value of single cash flow & annuity –Present value and discounting-present value of single cash flow, annuity & perpetuity. Simple interest & Compound interest & loan amortization schedule
(Simple problems on FV, FV for Annuity, PV and PV for annuity & Amortization Schedule)
Self-Learning Activity: Students will Write their own simple problems based on the concepts and solve them. Example: "Calculate the FV of $1,000 invested for 5 years at 6% compound interest." Students are engaged in preparing the Loan amortization table with detailed interpretation.
Students can Create mind maps showing the relationships and key components of risk management, financial engineering, derivatives, and behavioral finance.
Textbook 3: Part III; Chapter 6

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Recall the basic accounting concepts and terminologies
CO2	Understanding of journal, ledger, trial balance subsidiary books and accounting Equation and final accounts.
CO3	Analyze emerging trends in accounting
CO4	Familiar with the Emerging areas of financial management and create a Loan Amortization table.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**

CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Suggested Learning Resources:

Textbooks

1. Accounting for Management, Maheswari S. N, Maheswari Sharad K, Vikas Publishing House (P) Ltd., Ed 2024.
2. Accounting for Managers, H.H. Ramesha, Pralhad Rathod, Praveen Kumar B. H., R.G. Saha, Himalaya Publishing House Pvt Ltd.,
3. Financial Management, Prasanna Chandra, TMH, Ed 2024

References

1. Financial Management, Ravi M Kishor, Taxmann's. (Recent Edition)
2. Financial Management, I M Paney, Vikas Publishing House Pvt. Ltd. (Recent Edition)
3. Accounting for Management, Dr Jawahar Lal, Himalaya Publishing House Pvt Ltd., (Recent Edition)

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Building Construction Lab**		
Course Code:	**BCV456B**	**CIE Marks**	**50**
(L :T : P)	**0:0:2**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand and apply standard practices in masonry, plastering, and roofing as per relevant Indian Standards (IS) codes.
2. Identify various construction layout principles and demonstrate proper methods of scaffolding, Centering, and formwork assembly in accordance with architectural and structural requirements.
3. Perform surface finishing techniques including plastering, tile laying, painting, and curing, ensuring construction quality and durability.

Sl. No.	Experiments (11 slots)
1	**Identification and Use of Masonry** – *IS 1661:1972 – Code of practice for application of cement and lime plaster finishes*
2	**Layout Marking for Foundation Using Centreline Principles** – *IS 962:1989 – Code of practice for architectural and building drawings*
3	**Construction of Brick Walls and Understanding Bond Types** – *IS 2212:1991 – Code of practice for brickwork. (Calculation of quantities)*
4	**Construction of Rubble or Ashlar Masonry and Jointing Methods** – *IS 1905:1987 – Code of practice for structural use of unreinforced masonry (Calculation of quantities)*
5	**Identification and Assembly of Scaffolding and Centering** – *IS 4014 (Part 1 & 2):1967 – Code of practice for scaffolding*
6	**Study of formwork for Structures**– *IS 14687:1999 – Guidelines for formwork for concrete structures*
7	**Selection of Roofing Materials**– *IS 3007 (Part 1 & 2):1999 – Code of practice for laying of roofing materials*
8	**Plastering and Pointing Techniques on Masonry Surfaces** – *IS 1661:1972 – Code of practice for application of cement and lime plaster finishes*
9	**Surface Preparation and Paint Application Techniques** – *IS 1661:1972 – Code of practice for application of cement and lime plaster finishes*
10	**Tile Laying with Proper Finishing Techniques** – *IS 1443 (Suggested) – Code of practice for laying and finishing of cement concrete flooring tiles*
11	**Comparison of Curing Methods: Ponding, Wet Coverings, and Curing Compounds** – *IS 456:2000 – Code of practice for plain and reinforced concrete*

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Remember the relevant IS Codes for masonry, scaffolding, formwork, plastering, roofing, painting, flooring, and curing works.
CO2	Apply standard procedures for layout marking, masonry bonds, scaffolding, formwork, plastering, tile laying, and surface finishing in practical situations.

CO3	Analyze construction requirements by determining material quantities and selecting suitable techniques for masonry, plastering, roofing, flooring, and curing as per site conditions.

ASSESSMENT DETAILS (Both CIE and SEE)

1-Credit Lab Course			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. B. C. Punmia, A. K. Jain, and A. K. Jain, Building Construction, 12th ed., New Delhi, India: Laxmi Publications, 2024.
2. S. Kumar, Building Construction, 20th ed., Reprint. New Delhi, India: Standard Publishers Distributors, 2023.
3. M. L. Gambhir, Handbook on Masonry Construction. New Delhi, India: Tata McGraw Hill.

Reference Books / Codes

1. S. K. Duggal, Building Materials, 5th ed., New Delhi, India: New Age International Publishers, 2009.
2. R. Chudley and R. Greeno, Construction Technology, 5th ed., Abingdon, U.K.: Routledge, 2011.
3. M. S. Shetty, Concrete Technology: Theory and Practice, 8th ed., New Delhi, India: S. Chand & Company Pvt. Ltd., 2018.
4. P. K. Mehta and P. J. M. Monteiro, Concrete: Microstructure, Properties, and Materials, 4th ed., New York, NY, USA: McGraw Hill Education, 2014.
5. A. W. Beeby, Scaffolding and Formwork. London, U.K.: ICE Publishing.
6. J. J. A. Janssen, Structural Use of Bamboo. Beijing, China: INBAR (International Network for Bamboo and Rattan).
7. R. N. Reid, Roofing & Cladding Systems Handbook, 2nd ed., New York, NY, USA: McGraw Hill Education.
8. Bureau of Indian Standards, IS Codes Compilation for Civil Engineers. New Delhi, India: BIS.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Technical Writing Skills**		
Course Code:	**BCVT456C**	**CIE Marks**	**50**
(L :T : P) + SL	**(1:0:0) + (15 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Identify and apply appropriate formats, structures, and styles in writing technical reports, business reports, articles, and proposals.
2. Demonstrate the ability to condense, paraphrase, and construct effective paragraphs to improve clarity and precision in writing.
3. Produce ethically sound and properly cited professional documents, including resumes, blog posts, and social media content tailored to different audiences.
4. Integrate planning, drafting, and editing strategies to create well-organized, purposeful, and technically accurate communication materials.

Module-1: Technical Report Writing	**3 Hours**
Overview of the technical writing process (Planning – Drafting – Editing), Standard report structure– Title page, Abstract/Executive summary, Body, Conclusions, References; Common types of technical reports (Feasibility, Progress and Inspection).	
Module-2: Art of Condensation and Paragraph Writing	**3 Hours**
Introduction and importance of condensation and paraphrasing, Types and principles of condensation, Importance and techniques of paragraph writing, Features and construction styles of effective paragraphs.	
Module-3: Business Report Writing	**3 Hours**
Introduction, definition and salient features of business reports, Significance and types of reports (Formal, Informal), Resume building: Types and sample formats	
Module-4: Technical Articles and Proposals	**3 Hours**
Nature and significance of technical articles, Types of articles–Journal vs. Conference papers; Elements of a technical article–Title, Abstract, Introduction, Methods, Results, Discussion, References; Introduction to technical proposals–Purpose, Importance, Structure and Types.	
Module-5: Social Media Posts and Blog Writing	**3 Hours**
Ethics and best practices for technical social media communication, Principles and fundamentals of post composition, Guiding principles and common pitfalls in article composition, Maintaining etiquette and engagement strategies in blogs.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the process and structure of technical and business writing, including audience analysis and purpose-based document design.
CO2	Develop skills in summarization, paraphrasing, and paragraph construction to enhance clarity and coherence in professional writing.
CO3	Familiarize with various types of professional documentation such as reports, technical articles, proposals, resumes, and social media content.
CO4	Apply ethical standards, citation rules, and formatting conventions to produce accurate, well-structured, and audience-appropriate documents.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Suggested Learning Resources:

Text Books

1. Sanjay Kumar and Pushp Lata (2018). "Communication Skills," 2nd ed., Oxford University Press, 2015
2. M. Ashraf Rizvi, "Effective Technical Communication, " 2nd ed., McGraw Hill Education, 2017.

Reference Books

1. Gajendra Singh Chauhan and Smita Kashiramka, "Technical Communication," Cengage Learning India Private Limited,2018
2. Meenakshi Raman and Sangeeta Sharma, "Technical Communication: Principles and Practice," 3rd ed., Oxford University Press, 2015.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Plumbing and Drainage Systems for Residential Buildings**		
Course Code:	**BCV456D**	**CIE Marks**	**50**
(L :T : P) + SL	**(1:0:0) + (15 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Identify and describe the function of various plumbing fixtures and components, including toilets, sinks, showers, pipes, fittings, and valves used in water supply and drainage systems.
2. Explain the purpose and working principles of essential plumbing elements such as traps, vents, cleanouts, and differentiate between various drainage systems like septic tanks and sewer connections.
3. Assess the quality and effectiveness of plumbing installations and maintenance practices based on standard performance criteria and system reliability requirements.

Module – 1: Plumbing System	**3 Hours**
Introduction to Building Services, Plumbing- Classification, Plumbing fixtures, Lavatory, Indian standards, and Plumbing by-laws (NBC).	
Module – 2: Piping System	**3 Hours**
Water Supply Piping – Hot and cold water, flushing water, Piping in sunken and false ceiling areas, Shaft sizes, Traps – Floor traps, P-trap, S- trap, Q-trap, Bottle traps, Single stack, Two stack; Types of elbows. **Flow Control Valves** –Ball valve, Check valves / Non return valve, Gate valve, Globe valves, Butterfly valves, Pressure reducing valves & station. Water meters and its types.	
Module – 3: Fundamentals of Drainage Planning	**3 Hours**
Principles of drainage, testing of house drains, Gradients used in laying drains and sewers, Self-cleaning and non-scoring velocities for drain pipes, Inspection Chambers (IC), Design considerations for drainage systems (No numerical problems)	
Module – 4: Water Supply System	**3 Hours**
Pipe Materials - GI, PPR, CPVC, UPVC, Composite pipes and Copper. **Plumbing plan**-Water supply & distribution piping layout, Piping isometric layout.	
Module – 5: Wastewater System	**3 Hours**
Sanitary pipe material, Layout and design principles of sanitation, placement and constructional details. Study of internal & external drainage system of various buildings including small residences, apartments and public buildings.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental principles of plumbing systems, including water supply, drainage, and sanitation, as per Indian standards and NBC guidelines.
CO2	Design and analyze plumbing layouts for residential and commercial buildings, incorporating appropriate materials, fixtures, and standards.
CO3	Apply the principles of drainage systems, trap classifications, and gradient calculations to develop efficient and sustainable sanitation solutions.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Suggested Learning Resources:

Text Books

1. Plumber**, "**National council of educational research and training (NCERT)," 1st ed., 2000
2. Mitchell Frankel, **"**Facility piping systems Handbook" 3rd ed., McGraw Hill.

Reference books

1. Uniform Illustrated Plumbing Code-India (UIPC-I) published by IPA and IAPMO(India)
2. National Building Code (NBC) of India
3. IS 17650, Part 1 and Part 2 for Water Efficient Plumbing Products Water Efficient Products-India (WEP-I) published by IPA and IAPMO (India)
4. Water Efficiency and Sanitation Standard (WE. Stand) published by IPA and IAPMO(India)

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV			
Course Title:	**Electrical Wiring and Safety for Buildings**		
Course Code:	**BCV456E**	**CIE Marks**	**50**
(L :T : P) + SL	**(1:0:0) + (15 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Identify different types of electrical wiring systems, their selection criteria, and assess the requirements for various types of buildings, including domestic wiring standards.
2. Plan and interpret basic electrical layouts with appropriate placement of switches, sockets, and appliances, ensuring compliance with safety and installation requirements.
3. Understand essential equipment and personal safety measures in electrical systems, including the functioning of fuses and MCBs, earthing systems, and precautions against electric shock.

MODULE – 1: Introduction	**3 Hours**
Wiring systems - types, requirements, merits, and demerits Factors affecting the Selection of Wiring system, Gauges of wires, General Requirements of Electrical Installation.	
MODULE – 2: Electrical requirements for types of building	**3 Hours**
Domestic Wiring: Requirements, Types of wiring: casing, capping. Two way and three-way control of load. 5amp & 15-amp circuits Single-phase and Multi-phase Electrical Setups.	
MODULE – 3: Key requirements for electrical drawing for buildings	**3 Hours**
Planning the layout of wiring systems, including switches, outlets, and appliance connections. Grounded (3-pin) and multi-phase (5-pin) Electrical Plugs.	
MODULE – 4: Equipment Safety measures	**3 Hours**
Working principle of Fuse and Miniature Circuit Breaker (MCB), merits and demerits	
MODULE – 5: Personal safety measures	**3 Hours**
Electric Shock, Earthing and its types, Safety Precautions to avoid shock and insulation.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Identify and compare various types of wiring systems, evaluate their requirements apply appropriate selection criteria for different building types based on domestic wiring standards.
CO2	Plan and interpret basic electrical drawings by determining suitable layouts for switches, sockets, and appliance connections to ensure safe and efficient wiring systems.
CO3	Explain equipment and personal safety measures in electrical systems, including working principles of fuses and MCBs, types of earthing, and precautions to prevent electric shock.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Suggested Learning Resources:

Text Books

1. D. C. Kulshreshtha, "Basic Electrical Engineering", 1st ed., Tata McGraw Hill, 2019.
2. B. L. Theraja, "A Textbook of Electrical Technology", Reprint ed., S. Chand, 2014.

Reference Books

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", 4th ed., Tata McGraw Hill, 2019.
2. V. K. Mehta and Rohit Mehta, "Principles of Electrical Engineering & Electronics", 2nd ed., S. Chand, 2015.
3. Rajendra Prasad, "Fundamentals of Electrical Engineering", 3rd ed., PHI Learning, 2014.

B.E. (Common to All Branches) Outcome Based Education(OBE) and Choice Based Credit System(CBCS) SEMESTER – IV			
Course Title:	**Environmental Studies**		
Course Code:	**BENS407 / 507**	**CIE Marks**	**50**
(L : T : P)+ SL	**(2:0:0) + (30 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**2**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Introduce the basic concepts of ecology and ecosystem functioning, including biodiversity and biogeochemical cycles.
2. Understand various types of environmental pollution, their sources, impacts, and preventive measures.
3. Explore causes of environmental degradation and methods of conservation with special emphasis on Indian biodiversity.
4. Create awareness about climate change, global warming, environmental legislation, and significant environmental movements in India.

Module-1	**6 Hours**
Ecology: Basic concepts of ecosystem. Ecosystems (structure and function) - forest, desert, wetlands, river, oceanic and lake. Biotic and Abiotic components; Food chain; Ecological pyramid. **Biogeochemical Cycles:** carbon cycle, nitrogen cycle, phosphorus cycle, water cycle **Sustainability:** 17 Sustainable Development Goals (SDG) - history, targets, implementation, capacity development.	
Module-2	**6 Hours**
Environmental Pollution: Surface and ground water pollution, noise pollution, soil pollution, air pollution and marine pollution - sources, impacts on living beings, impacts on environment, preventive measures. Case-study on marine pollution. **Water Chemistry:** Significance and effect of pH, total dissolved solids and hardness. Case study on impact of fluoride on human health.	
Module-3	**6 Hours**
Environmental Degradation: Causes and effects of deforestation, desertification, soil erosion and glacier melting. **Environmental Conservation:** Significance and key features of national parks, wildlife sanctuaries, reserved forest and mangrove forest. Importance of western Ghats as biodiversity hotspot (flora and fauna)	
Module-4	**6 Hours**
Indian Monsoon and Global Warming **Climate-** Impact on monsoons, significance of El Nino and La Nina on India climate. **Global warming:** causes, greenhouse gases, effects on environment and human health. Causes and effects of acid rain and ozone depletion. Air sampler and its importance in assessing pollutants.	
Module-5	**6 Hours**
Environmental Legislation: Environmental Protection Act 1984: Definition, Significance and key features. **Indian Environmental Movements:** Bishnoi Movement, Chipko & Appiko movement.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Describe the components and functions of ecosystems and explain major biogeochemical cycles and sustainability goals.
CO2	Understand various forms of pollution and environmental degradation, along with their impacts on ecosystems and human health.
CO3	Demonstrate awareness of climate issues, Indian environmental legislation, and the role of community-based movements in environmental protection.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Suggested Learning Resources:

Text books

1. Benny Joseph, "Environmental studies", 3rd ed., Tata McGraw-Hill, 2017.
2. S M Prakash, "Environmental studies", 3rd ed., Pristine publishing house, 2018.

Reference Books

1. M. Anji Reddy, "Text book of environmental science and Technology", revised ed., B S

publications, 2014.
2. Dr. B. S Chauhan, "Environmental studies", 1st ed., University of science press, 2008.

B.E. (Common to all branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – IV / V			
Course Title:	**BIOLOGY FOR ENGINEERS**		
Course Code:	**BBOE407/507**	**CIE Marks**	**50**
(L: T: P) + SL	**(2:0:0) + (30 Hours/Sem)**	**SEE Marks**	**50**
Credits:	**2**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Familiarize the students with the basic biological concepts and their engineering applications.
2. Enable the students with an understanding of bio design principles to create novel devices and structures.
3. Provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.
4. Motivate the students to develop interdisciplinary vision of biological engineering.

Module-1	**6 Hours**
Introduction to fundamentals of life. Structure and functions of a cell. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, Proteins, Enzymes and Lipids.	
Module-2	**6 Hours**
Introduction to applications of biomolecules, Carbohydrates in cellulose-based water filters production, PHA and PLA in bioplastics production, Nucleic acids in vaccines and diagnosis, Proteins in food production, Enzymes in biosensors fabrication, food processing, enzymes in bio bleaching, Lipids in biodiesel and detergents production.	
Module-3	**6 Hours**
Introduction to adaptations of anatomical principles for bioengineering design, Brain as a CPU system. Eye as a Camera system. Heart as a pump system. Lungs as purification system. Kidney as a filtration system.	
Module-4	**6 Hours**
Introduction to nature inspired biomaterials and mechanisms, Echolocation, Photosynthesis. Bird flying, Lotus leaf effect, Plant burrs, Shark skin, Kingfisher beak. Artificial blood - haemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs).	
Module-5	**6 Hours**
Introduction to trends in bioengineering, Tissue engineering, stem cells and their applications, Bio printing techniques and materials. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bio imaging and Artificial Intelligence for disease diagnosis. Bio concrete.	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Corroborate the concepts of biomimetic for specific requirements.
CO2	Understand the basic biological concepts for relevant industrial applications.
CO3	Evaluate the principles of design and development, for exploring engineering knowledge in biological
CO4	Think critically towards exploring innovative bio based solutions for socially relevant problems.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Suggested Learning Resources:

Textbooks

1. Basuchandra's Biology for Engineers, Chandra shekara. B.M, Basavaraju B.C, 2025.
2. Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.

Reference Books

1. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022

2. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W.
3. Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
4. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
5. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
6. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
7. Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
8. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C.
   Mattiussi, MIT Press, 2008.
9. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha, A C Udayashankar, Lambert Academic Publishing, 2019.

B.E. (Common to All branches)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Course Title:	**Universal Human Values (UHV)**		
Course Code:	**BUHV408**	**CIE Marks**	**50**
(L: T: P) + S	**(1:0:0) + (15 Hours / Sem)**	**SEE Marks**	**50**
Credits:	**1**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
4. This course is intended to provide a much-needed orientation input in value education to the young enquiring minds.

Module-1 **3 Hours**

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.

Self-Learning Activity: Self-exploration exercise where students write about their understanding of happiness and prosperity.

Module-2 **3 Hours**

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.

Self-Learning Activity: Students will categorize their daily needs into 'self' and 'body' to understand their coexistence.

Module-3 **3 Hours**

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.

Self-Learning Activity: Students will write and share a personal story where trust or respect played a key role in a relationship.

Module-4 **3 Hours**

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, The Holistic Perception of Harmony in Existence. **Self-Learning Activity**: Students will have a nature walk to observe and reflect on coexistence and mutual fulfilment in nature.
Module-5 **3 Hours**
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. **Self-Learning Activity**: Students are engaged in drafting their personal code of professional ethics aligned with human values.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Identify and describe the role of self, family, society, and nature in achieving holistic human well-being.
CO2	Analyze real-life personal and societal problems through the lens of human values and ethical reasoning.
CO3	Apply human values to interpersonal and professional situations to ensure harmony in relationships and society.
CO4	Integrate sustainability, ethics, and lifelong learning into personal and professional practices.

ASSESSMENT DETAILS (Both CIE and SEE)

1 and 2-Credit Theory Courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**

SEE (C)	**50**	**18**	**Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Suggested Learning Resources:

Textbooks

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 Teacher's 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 (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)
14. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
15. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
16. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
17. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
18. A N Tripathy, 2003, Human Values, New Age International Publishers.

19. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
20. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
21. M Govindrajan, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
22. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
23. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title:	**NSS-National Service Scheme**		
Course Code:	**BNSK359**	**CIE Marks**	**100**
L : T : P: SL	**0:0:0:30**	**SEE Marks**	**---**
Credits:	**0**	**Exam Hours**	**---**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

4. Identify the needs and problems of the community and involve the problem–solving.
5. Develop among them a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
6. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Module-1
Introduction and Basic Concepts of NSS Aims and Objective of NSS. Emblem, Moto, Flag Role and Responsibility of youth in various activities of NSS
Module-2
Youth Leadership Definition of Leadership and Important components (Social, Mental, Moral and Cultural) Qualities and Characteristics of good leaders Role of Youth leadership
Module-3
Community Work through NSS Community Work: Meaning and Nature Concept of regular activities undertaking of NSS
Module-4
NSS Activity-1
Module-5
NSS Activity-2

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the motto and concepts of NSS
CO2	Develop overall personality of volunteers and make them as leaders and responsible citizens of our nation
CO3	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO4	Communicate effectively with the community and with the officials.

ASSESSMENT DETAILS (Both CIE and SEE)

Zero-credit NCMC courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods as per 24RNBE4.2, scaled to 40 marks.
Total CIE (A+B)	**100**	**40**	**CIE Evaluation is done for a maximum of 100 marks.**
• The minimum marks to be secured in CIE is 40 (40%) out of allotted 100 marks to Pass.			

Suggested Learning Resources:

Reference 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.

Web links

1. https://nss.gov.in/
2. https://pledge.mygov.in/

B.E. (Common to All Branches)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Course Title:	**Physical Education**		
Course Code:	**BPEK359**	**CIE Marks**	**100**
L: T: P: S	**0:0:1:0**	**SEE Marks**	**---**
Credits:	**---**	**Exam Hours**	**---**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

5. Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
6. Familiarization of health-related Exercises, Sports for overall growth and development
7. Participate in the competition at regional/state / national / international levels.
8. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

Module-1 **5 Hours**

Orientation

D. Meaning and Importance of Physical Education
E. Lifestyle
F. Health & Wellness

Module-2 **5 Hours**

General Fitness & Components of Fitness

D. Meaning and Importance of Fitness
E. Warming up (Free Hand exercises)
F. Strength – Push-up / Pull-ups

Module-3 **5 Hours**

Specific games (Anyone to be selected by the student)

C. Kabaddi

f) Fundamental skills
Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.

g) Offensive Skills:
Raiding, Hand Touch, Toe Touch, Dubki, Squat Thrust

h) Defensive Skills:
Tackling, Ankle Hold, Thigh Hold, Waist Hold, Blocking, Chain Tackle

i) Other Important Skills:
Agility, Speed, Breath Control, Breath Holding

j) Rules and their interpretation and duties of the officials

D. Kho-Kho

f) Fundamental skills
Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.

g) Skills in Chasing:
Sit on the box (Parallel & Bullet toe method), Get up from the box (Proximal & Distal foot method), Give Kho (Simple, Early, Late & Judgment), Pole Turn, Pole Dive, Tapping, Rectification of foul.

h) Skills in running:
Chain Play, Ring play and Chain & Ring mixed play.

i) Game practice with application of Rules and Regulations. **j) Rules and their interpretations and duties of the officials.**

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
CO2	Familiarization of health-related Exercises, Sports for overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Zero-credit NCMC courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods as per 24RNBE4.2, scaled to 40 marks.
Total CIE (A+B)	**100**	**40**	**CIE Evaluation is done for a maximum of 100 marks.**
• The minimum marks to be secured in CIE is 40 (40%) out of allotted 100 marks to Pass.			

Suggested Learning Resources:

Textbooks

1. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
2. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata.

Reference Books

1. Saraswati Health and Physical Education Textbook
2. V.K. Sharma's Health and Physical Education

B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS) SEMESTER – III			
Course Title:	**Yoga**		
Course Code:	**BYOK359**	**CIE Marks**	**100**
L: T: P: S	**0:0:1:0**	**SEE Marks**	**---**
Credits:	**---**	**Exam Hours**	**---**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

6. Physical, Mental & spiritual Objectives of Yoga
7. Explain the meaning of Yoga.
8. Discuss the importance of the Yoga and its scope.
9. Describe the aims and objectives of Yoga.
10. Clarify the misconceptions on Yoga

Module-1	**5 Hours**

Orientation

d) Introduction of Yoga
e) Aim, and Objectives of Yoga,
f) Yoga, its origin, history and development.

Module-2	**5 Hours**

Yoga

f) Yoga, its meaning, definitions.
g) Brief introduction of yogic practices for the common man
h) Rules and regulations
i) Misconceptions of Yoga
j) Surya Namaskar

Module-3	**5 Hours**

Asanas

Types of Asanas:

e)	**Sitting-**	1. Padmasana,	2. Vajrasana
f)	**Standing-**	1. Vrikshana,	2. Trikonasana
g)	**Prone line-**	1. Bhujangasana	2. Shalabh asana
h)	**Supine line-**	1. Utthita dvipadasana	2. Ardha halasana

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Yoga
CO2	Improves of health and related aspects, overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Zero-credit NCMC courses (MCQs for assessment)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE - IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods as per 24RNBE4.2, scaled to 40 marks.
Total CIE (A+B)	**100**	**40**	**CIE Evaluation is done for a maximum of 100 marks.**
• The minimum marks to be secured in CIE is 40 (40%) out of allotted 100 marks to Pass.			

Suggested Learning Resources:

Textbooks

1. The Yoga Sutras of Patanjali – Sri Swami Satchidananda.
2. Light on Yoga — B.K.S Iyengar.

Reference Books

1. The Heart of Yoga — T.K.V Desikachar.
2. "Asana Pranayama Mudra Bandha" by Swami Satyananda Saraswati.

VISION

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- Attracting quality students and preparing them with a strong foundation in fundamentals so as to achieve distinctions in various walks of life leading to outstanding contributions.
- Imparting value based, need based, choice based and skill based professional education to the aspiring youth and carving them into disciplined, World class professionals with social responsibility.
- Promoting excellence in Teaching, Research and Consultancy that galvanizes academic consciousness among Faculty and Students.
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