BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

Avalahalli, Yelahanka, Bengaluru 560064

Bachelor of Engineering

Department of Civil Engineering

VI Semester Scheme and Syllabus
2022 Scheme - Autonomous

Approved in the BoS meeting held on 03/03/2025

Program Educational Objectives (PEOs)

- Lead a successful career by analyzing, designing and solving various problems in the field of Civil Engineering.
- Execute projects through team building, communication and professionalism.
- Excel through higher education and research for endured learning.
- Provide effective solution for sustainable environmental development.

Vision and Mission of the Department

Vision

To be an Exemplary Centre, disseminating quality education and developing technically competent civil engineers with professional integrity for the betterment of society.

Mission

- Impart technical proficiency through quality education.
- Motivate entrepreneurship through enhanced industry - interaction and skill-based training.
- Inculcate human values through outreach activities.

Program Specific Outcomes (PSOs)

- Identify & address the challenges in transportation, sanitation, waste management, and urban flooding in metropolitan cities.
- Provide solutions related to civil engineering built environment through a multidisciplinary approach.

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BMS Institute of Technology and Management
(An Autonomous Institution, Affiliated to VTU Belagavi)
Avalahalli, Doddaballapur Main Road, Bengaluru, Karnataka – 560064

REVISED

Date: 18-12-2024

CONTINUOUS INTERNAL EVALUATION (CIE)
AND
SEMESTER END EXAMINATION (SEE) PATTERN

(Applicable to UG students admitted from the 2022 batch, effective from the Academic year 2024-25 onwards)

The UG students admitted from the 2022 batch onwards are hereby informed to note the following regarding Continuous Internal Evaluation and Semester End Examination pattern:

- The Weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Examination (SEE) is 50%.
- The Minimum passing mark for the CIE is 40% of the Maximum marks (i.e. 20 marks out of 50) and for the SEE minimum passing mark is 35% of the Maximum marks (i.e. 18 out of 50 marks).
- A student will be declared to have passed the course if they secure a minimum of 40% (i.e. 40 marks out of 100) in the combined total of the CIE and SEE.

The following tables summarize the CIE and SEE Patterns for the courses of various credits:

IPCC COURSES: 4 CREDITS OR 3 CREDITS						
Evaluation Type		**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Theory Component	CIE – IA Tests	CIE – Test 1 (1.5 hr)	40	20	-	The sum of the two internal assessment tests will be **80 Marks** and the same will be scaled down to **20 Marks**.
		CIE – Test 2 (1.5 hr)	40			

	CIE – CCA (Comprehensive Continuous Assessment)	CCA	10	05	-	Any one assessment method can be used from the list appended below.
	Total CIE Theory			**25**	**10**	
Practical Component	CIE - Practical		30	15	-	Each laboratory experiment is to be evaluated for **30 Marks** using appropriate rubrics.
	CIE Practical Test		20	10	-	One test after all experiments to be conducted for **20 Marks**
	Total CIE Practical			**25**	**10**	
Total CIE Theory + Practical				**50**	**20**	
SEE			100	50	18	SEE exam is a theory exam, conducted for **100 Marks**, scored marks are scaled down to **50 Marks.**
CIE + SEE				**100**	**40**	
The laboratory component of the IPCC shall be for CIE only.						

Professional Core Courses (PCC) / Engineering Science Courses (ESC): 03 and 02 Credit						
Evaluation Type		**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Theory Component	CIE – IA Tests	CIE – Test 1 (1.5 hr)	40	30	-	The sum of the two internal assessment tests will be **80 Marks** and the same will be scaled down to **30 Marks**.
		CIE – Test 2 (1.5 hr)	40			
	CIE - CCAs	CCA	20	20	-	Any Two assessment methods can be used from the list. If it is project-based, one CCA shall be given.
	Total CIE Theory			**50**	**20**	
SEE			100	50	18	SEE is a theory exam, conducted for **100 Marks**, scored marks are scaled down to **50 Marks.**
CIE + SEE				**100**	**40**	

NON-IPCC COURSES: 01 Credit Course - MCQ						
Evaluation Type		**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Continuous Internal Evaluation Component	CIE – IA Tests (MCQs)	CIE – Test 1 (1 hr)	40	40	-	The question paper pattern for this course shall be an **MCQ** of **1 or 2 Marks (s).** The questions with 2 Marks can be framed based on a higher Bloom's level. The sum of the two internal assessment tests will be **80 Marks**, and the same will be scaled down to **40 Marks**.
		CIE – Test 2 (1 hr)	40			
	CIE - CCAs	CCA	10	10	-	Any One Assessment method can be used from the list provided below.
	Total CIE			**50**	**20**	
SEE (MCQ Type)				50	18	The question paper pattern for this course shall be an **MCQ** of **1 or 2 Marks (s).** The questions with 2 Marks can be framed based on higher Bloom's level. MCQ-type question papers of 50 questions with each question of a **01 Mark**, examination duration is 01 hour.
CIE + SEE				**100**	**40**	

Professional Core Course Laboratory (PCCL) /Ability Enhancement Course Laboratory (AEC) - 01 Credit					
Evaluation Type	**Internal Assessments (IAs)**	**Test/ Exam Marks Conducted for**	**Marks to be scaled down to**	**Min. Marks to be Scored**	**Evaluation Details**
Continuous Internal Evaluation	CIE - Practical	30	30		Each laboratory experiment is to be evaluated for **30 Marks** using appropriate rubrics.
	CIE - Practical Test	50	20		One test after all experiments is to be conducted for **50 Marks** and to be scaled down to **20 Marks**.
	Total CIE	-	**50**	**20**	
Semester End Examination		100	50	18	SEE to be conducted for **100 Marks**.
CIE+SEE		**100**		**40**	

Learning Activities for CCAs:

A faculty member may choose the following CCAs based on the needs of the course:

1. Course project
2. Literature review
3. MOOC
4. Case studies
5. Tool exploration
6. GATE-based aptitude test
7. Open book tests
8. Industry integrated learning
9. Analysis of Industry / Technical / Business reports
10. Programming assignments with higher Bloom level
11. Group discussions
12. Industrial / Social / Rural projects

CoE 18/12/2024

Dean AA 18.12.24

Principal 18/12/24

Copy To:

1. The Vice-Principal, Deans, HoDs, and Associate HoDs
2. All faculty members and students of 2022, 2023, and 2024 batch.
3. Examination Section

Scheme of VI Semester

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institution Affiliated to VTU, Belagavi)

B. E. in Civil Engineering

Scheme of Teaching and Examinations – 2022 Scheme

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)

VI Semester

Sl. No.	Course Category	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Credits Distribution				Examination				Contact Hours/week
					L	T	P	Total	CIE Marks	SEE Marks	Total Marks	SEE Duration (H)	
1	IPCC	BCV601	Design of RCC Structures	TD: CV PSB: CV	3	0	1	4	50	50	100	3	5
2	PCC	BCV602	Estimation and Contract Management		3	1	0	4	50	50	100	3	5
3	PCC	BCV603	Water Resource and Irrigation Engineering		3	0	0	3	50	50	100	3	3
4	PEC	BCV604x	Professional Elective Course II		3	0	0	3	50	50	100	3	3
5	OEC	BCV605x	Open Elective Course I		3	0	0	3	50	50	100	3	3
6	PW	BCVP606	Major Project Phase I		0	0	3	3	100	-	100	-	6
7	PCCL	BCVL607	Software Application Lab		0	0	1	1	50	50	100	3	2
8	AEC	BCV608X	Ability Enhancement Course/Skill Enhancement Course		For Theory course			1	50	50	100	1	1
					1	0	0						
					For Practical course							2	2
					0	0	1						
9	NCMC	BNSK609	National Service Scheme (NSS)	NSS Coordinator	0	0	0	0	100	-	100	-	2
		BPEK609	Physical Education (Sports and Athletics)	PED									
		BYOK609	Yoga	Yoga Teacher									
		BNCK609	National Cadet Corps (NCC)	NCC officer									
		BMUK609	Music	Music Teacher									
10	NCMC	BIKS610	Indian Knowledge System	Any Department	0	0	0	0	100	-	100	-	1
TOTAL								**22**	**650**	**350**	**1000**	**-**	**33**

IPCC: Integrated Professional Core Course, **PCC**: Professional Core Courses, **PEC**: Professional Elective Course, **OEC**: Open Elective Course, **PCCL**: Professional Core Course laboratory,

NCMC: Non-Credit Mandatory Course, **ESC**: Engineering Science Course, **AEC**: Ability Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation.

Professional Elective Course II		**Open Elective Course I**		**Ability Enhancement Course**	
Course Code	**Course Name**	**Course Code**	**Course Name**	**Course Code**	**Course Name**
BCV604A	Intelligent Transportation Systems	BCV605A	Water conservation and Rainwater Harvesting	BCV608A	Building Information Modelling in Civil Engineering - Advanced
BCV604B	Numerical Methods in Civil Engineering	BCV605B	Satellite Remote Sensing and GIS	BCV608B	Structural Health Monitoring Using Sensors
BCV604C	Applied Geotechnical Engineering	BCV605C	Integrated Waste Management for a Smart City	BCV608C	Finishing School for Civil Engineering
BCV604D	Hydro Informatics and modelling	BCV605D	Occupational Safety and Health Monitoring	BCV608D	Occupational Safety and Health Aspects in Civil Engineering
BCV604E	Air Pollution and Control			BCV608E	Drone Surveying
				BCV608F	Introduction to Generative AI for Civil Engineering

Integrated Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical's of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L: T: P) can be considered as (3: 0: 2) or (2: 2: 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

National Service Scheme /Physical Education/Yoga/NCC/Music: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), Yoga (YOG), National Cadet Corps (NCC) and Music with the concerned coordinator of the course during the beginning of each semester starting from III semester to VII semester. In every semester, students should choose any one mandatory course among the available 5 courses without repeating the course again. Activities shall be carried out in each of the semesters from III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering a professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses (OEC): Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor.

Selection of an open elective shall not be allowed if,

- The candidate has studied the same course during the previous semesters of the program.
- The syllabus content of open electives is similar to that of the Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the program.
- The minimum students' strength for offering open electives is 10. However, this condition shall not be applicable to cases where the admission to the program is less than 10.

Project Phase-I: Students have to discuss with the mentor /guide and with their help he/she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

VI Semester Syllabus

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Design of RCC Structures (3:0:1) 4

(Effective from the academic year 2024-25)

Course Code	BCV601	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	50
Total Number of Contact Hours	40 +10	Exam Hours	03

Course objectives:

1. 1. Identify, formulate and solve engineering problems of RC elements subjected to different kinds of loading.
2. Follow a procedural knowledge in designing various structural RC elements.
3. Impart the usage of codes for strength, serviceability and durability.
4. Acquire knowledge in analysis and design of RC elements.

Module-1

Design Philosophy: Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section. Working stress method, Difference between Working stress and Limit State Method of design, Limiting deflection, short term deflection, long term deflection, Calculation of deflection of singly reinforced beam only. Calculation of crack width for singly reinforced beam.

Module-2

Design of Beams: Analysis of singly reinforced, doubly reinforced and flanged beams for flexure and shear. Design of singly reinforced beams with check for shear, check for development length and other checks. Design of doubly reinforced beams and flanged sections, Design beam for torsion.

Module-3

Design of Slabs and Stairs: Introduction to one way and two-way slabs, Design of Cantilever, simply supported and one-way continuous slab. Design of two-way slabs for different boundary conditions. Design of dog legged and open well staircases.

Module-4

Deign of Columns: Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments. Introduction to long columns.

Module-5

Deign of Footings: Types of footings, Design concepts of the footings. Design of isolated footings with axial load.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Calculation of deflection of singly reinforced beam using Excel.
2	Calculation of crack width of singly reinforced beam using Excel.
3	Design of a simply supported RCC singly reinforced beam using Excel and draw the reinforcement details.
4	Design of a simply supported RCC doubly reinforced beam using Excel and draw the reinforcement details.
5	Design of a cantilever beam using Excel and draw the reinforcement details.
6	Design of a beam for torsion using Excel.
7	Design a simply supported RCC one-way slab using Excel and draw the reinforcement details.
8	Design a two-way slab using Excel and draw the reinforcement details.
9	Design a short axially loaded RC column using Excel.
10	Design the reinforcement for RCC square and circular column with isolated square footing.

Course outcome

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

CO 1: Differentiate various design philosophies and principles for reinforced concrete elements as per Indian Standard.

CO 2: Design the RCC beams with necessary checks as per IS Specifications.

CO 3: Design the RCC slabs and staircases as per IS Specifications.

CO 4: Design the RCC columns as per IS Specifications.

CO 5: Design the RCC footings as per IS Specifications.

Suggested Learning Resources:

Books

1. Unnikrishnan Pillai and Devdas Menon, "Reinforced Concrete Design" ,4th Edition, McGraw Hill, New Delhi,2021.
2. N Subramanian, "Design of Concrete Structures" , Oxford university Press,2013.
3. H J Shah, "Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)",9th Edition, Charotar Publishing House Pvt, Ltd, 2011.

Reference Books:

1. P C Varghese, "Limit State design of reinforced concrete",2nd Edition, PHI, New Delhi.2008.
2. W H Mosley, R Husle, J H Bungey, "Reinforced Concrete Design",5th Edition, MacMillan Education, Palgrave publishers,1999.
3. Kong and Evans, "Reinforced and Pre-Stressed Concrete", Springer Publications,1987.
4. A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press,2000
5. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", Wiley India Pvt Ltd, Inc,2009

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/105105105

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

- Students to prepare the models showing the reinforcement details in singly reinforced, doubly reinforced beams, Columns, Staircases and footings.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

ESTIMATION AND CONTRACT MANAGEMENT (3:1:0) 4

(Effective from the academic year 2024-25)

Course Code	BCV602	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:2:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	03

Course objectives:

1. Estimate the quantities of work, develop the bill of quantities and arrive at the Cost of civil engineering Project
2. Understand and apply the concept of Valuation for Properties
3. Understand, Apply and Create the Tender and Contract document.

Module-1

Quantity Estimation for Building: Study of various drawing attached with estimates, important terms, units of measurements, abstract, Types of estimates. Estimation of building by Short wall and long wall method - centre line method (1BHK/2BHK/3BHK).

Module-2

Estimate R.C.C work and Structural Elements: Estimate the steel quantity (Bar bending schedule) and concrete of R.C.C structural elements-slab, beam, column, footings. Estimate of a R.C.C framed building.

Module-3

Estimate of other building components: Sanitary work: Manhole and septic tanks and slab culvert. Estimation of Steel Truss: King Truss and Queen Truss.

Quantity Estimation for Roads: Computation of volume of earthwork fully in banking, cutting, partly cutting and partly Filling by mid-section, trapezoidal and Prismoidal Methods.

Module-4

Specification for Civil Engineering Works: Objective of writing specifications essentials in specifications, general and detail specifications of different items of works in buildings and roads.

Analysis of Rates: Factors Affecting Cost of Civil Works, Concept of Direct Cost, Indirect Cost and Project Cost Rate analysis and preparation of bills, Data analysis of rates for various items of Works, Sub-structure components, Rate analysis for R.C.C. slabs, columns and beams.

Module-5

Contract Management-Post Award: Tendering process, E-Tendering , Contract Forms: FIDIC contract Forms, CPWD, NHAI, NTPC, NHEPC., Basic understanding on definitions, Performance security, Mobilization and equipment advances, Secured Advance, Suspension of work, Time limit for completion, Liquidated damages and bonus, measurement and payment, additions and alterations or variations and deviations, breach of contract, Escalation, settlement of account or final payment, claims, Delay's and Compensation, Disputes & its resolution mechanism, Contract management and administration.

Valuation: Definitions of terms used in valuation process, Purpose of valuation, Cost, Estimate, Value and its relationship, Capitalized value. Freehold and lease hold and easement, Sinking fund, depreciation–methods of estimating depreciation, Outgoings, Process and methods of valuation: Rent fixation, valuation for mortgage, valuation of land.

Course outcome

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

CO 1: Estimate the quantities and work out the cost and preparation of abstract for the estimated cost for a various civil engineering works.

CO 2: Prepare detailed and abstract estimates for various building and road components.

CO 3: Prepare the specifications and analyze the rates for various items of work.

CO 4: Assess contract and tender documents for various construction works.

CO 5: Prepare valuation reports of buildings.

Suggested Learning Resources:

Books

1. Datta B.N., "Estimating and costing", UBSPD Publishing House, New Delhi., 2017.
2. Rangwala, C. "Estimating, Costing and Valuation", Charotar Publishing House Pvt. Ltd., 2017.
3. PWD Data Book, CPWD Schedule of Rates (SoR). and NH SoR – Karnataka FIDIC Contract forms B.S. Ramaswamy.

Reference Books

1. B.S. Patil, "Civil Engineering Contracts and Estimates", Universities Press.
2. M. Chakraborthi; "Estimation, Costing and Specifications", Laxmi Publications.
3. MORTH Specification for Roads and Bridge Works – IRC New Delhi
4. Kohli D.D and Kohli R.C, "Estimating and Costing", 12 th Edition, S.Chand Publishers, 2014.
5. Vazirani V.N and Chandola S.P, "Estimating and costing", Khanna Publishers, 2015.

Web links and Video Lectures (e-Resources):

- https://youtu.be/ofkpm4lhJcg
- https://youtu.be/GGikveOcaJw

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

- Conduction of technical seminars on recent research activities
- Site visits

B.E CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

Water Resources and Irrigation Engineering (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	BCV603	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

1. Understand basic concepts of engineering hydrology and irrigation structures
2. Apply fundamentals of irrigation engineering and determine crop water requirement
3. Compute abstractions in hydrology and their estimations
4. Analyze runoff and streamflow potential using hydrographs
5. Design canals, pipelines and irrigation water demand for a command area

Module – 1

Introduction to Hydrology: Hydrologic cycle, World water budget.

Precipitation –Forms, Types, Rain gauges (tipping bucket, weighing bucket and Syphon's), Hyetograph, Mean precipitation over an area, Estimation of missing rainfall data, Double mass curve technique.

Evaporation: factors, Measurement using IS Class A Pan, Estimation using empirical formulae, Evaporation losses in reservoirs and remedies.

Evapotranspiration-factors, measurement using lysimeters, Blaney Criddle method of estimation and problems.

Module – 2

Runoff- Catchment – types, stream pattern, description of the basin. Factors affecting runoff, Rainfall-runoff correlation, Urban flooding –causes and mitigation.

Hydrographs– Definition, Factors affecting flood hydrograph, Components of a hydrograph, Base flow separation, Effective rainfall, Unit Hydrograph- Definition, Assumptions and Limitations of Unit hydrograph, Derivation of unit hydrograph.

Module – 3

Infiltration: factors affecting infiltration capacity, measurement (double ring infiltrometer). Horton's infiltration equation, infiltration indices and problems

Watershed Management: Watershed concept, Characteristics of watershed. Flood and Drought management, Watershed flood modelling using Rational method, Dicken's formula and Ryve's formula.

Module – 4

Irrigation – Definition, Necessity, Aspects of Irrigation, Types of irrigation systems, Various irrigation methods.

Water Requirement of Crops – Irrigation requirement, functions of irrigation water, soil moisture constants- FC, PWP, AW, Depth of water applied, and Frequency of irrigation- problems.

Crop Characteristics- Crop co-efficient, Crop seasons, Crop period and Base period, Duty, Delta (Relationship between them) – problems and Irrigation Efficiencies, Gross Irrigation requirement.

Module – 5

Design of Irrigation Canals: Introduction, classification of irrigation canals, command area and types. Design of Canals –Silt theories, Kennedy's theory, Design procedure by Kennedy's theory- Design Problems, Lacey's theory, Regime channels and Regime conditions and design equations-Design problems. Canal sections - schematic diagrams.

Reservoir Planning: Types of reservoirs, Investigations of reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir, Reservoir yield, Mass curve and Demand curve, Reservoir operations of a multipurpose projects (IS 7323 : 1994)

Course outcomes:

The students will be able to:

CO 1: Estimate quantity of various water forms in hydrological processes.

CO 2: Correlate runoff and rainfall using hydrograph analysis.

CO 3: Comprehend management of water shed and infiltration techniques.

CO 4: Compute irrigation water requirement of crops for a command area.

CO 5: Design irrigation canals and reservoirs for a command area.

Teaching Practice:

- Classroom teaching (chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Text Books

1. 1. Subramanya, K. "Engineering Hydrology", 4e. Tata McGraw-Hill Education, 2013.
2. 2. Rami Reddy, P. Jaya.", A Text book of Hydrology", Laxmi publications New Delhi, 3rd Edition, 2013.
3. 3. Punmia, B. C., Pande Brij Basi Lal, Ashok Kumar Jain, and Arun Kumar Jain. "Irrigation and water power engineering". Laxmi Publications, Ltd., 2009.

References:

1. Modi, P. N., "Water Resources and Water Power Engineering". Standard book house, Delhi, 9th Edition, 2014.
2. 2. Patra, Kanhu Charan. "Hydrology and Water Resources Engineering". Alpha Science International, 2008.
3. Loucks, D.P., Stedinger, P.J.R., Haith, D.A., Water Resources Systems Planning and Management, Prentice Hall, New Jersy, 1987
4. Chaturvedi. M.C., Water Resources Systems Planning and Management. Tata McGraw Hill, New Delhi, 1997.

B.E. CIVIL ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER - VI

Intelligent Transportation Systems (3:0:0) 3
(Effective from the academic year 2024-25)

Course Code	BCV604A	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

1. Understand the fundamental concepts and components of Intelligent Transportation Systems (ITS).
2. Explore the technological, systems, and institutional aspects of ITS.
3. Analyze the benefits of ITS in enhancing transportation efficiency, safety, and sustainability.
4. Examine various ITS data collection techniques and their applications.
5. Discuss real-world ITS implementations and case studies.

Module-1

Introduction to Intelligent Transportation Systems (ITS): Definition and overview of ITS, Importance and need for ITS in modern transportation, Basic elements of ITS: technological, systems, and institutional aspects. **Advanced Traveller Information Systems (ATIS):** Principles and functionalities of ATIS, Real-time information dissemination, Traveler behaviour and decision-making.

Module-2

Technological Aspects of ITS: Overview of ITS technologies, Communication systems and data processing, Sensor technologies and their applications.
Advanced Transportation Management Systems (ATMS): Components and operations of ATMS, Traffic monitoring and control systems, Incident management and response.

Module-3

Benefits of ITS: Enhanced traffic management, Reduced congestion, Improved safety and emergency response, Environmental sustainability. Advanced Public Transportation Systems (APTS) and Commercial Vehicle Operations (CVO), Electronic Toll Collection (ETC) and New Technologies.

Module-4

ITS Data Collection Techniques: Overview of data collection methods, Detectors: inductive loops, infrared sensors, microwave radar, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), Video data collection and analytics.

Module-5

Regional Architecture and Infrastructure Integration: Development of regional ITS architecture, Integration of infrastructure, ITS Issues and Emerging Trends: Technical, economic, and policy challenges in ITS, Future directions and emerging trends in ITS, Impact of autonomous vehicles and smart cities on ITS.

Course outcome

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

CO 1: Comprehend on Intelligent Transportation Systems and Advanced Traveller Information Systems.
CO 2: Explore Advanced Transportation Management Systems.
CO 3: Analyse Advanced Public Transportation Systems (APTS), Commercial Vehicle Operations (CVO), new technologies, and Electronic Toll Collection (ETC).
CO 4: Examine the various data collection techniques used in ITS and be able to apply this knowledge to real-world transportation challenges.
CO 5: Discuss regional architecture, infrastructure integration, and summarize ITS issues considering various factors and emerging trends.

Suggested Learning Resources:

Books

1.A. J. Khattak and B. N. Janson, Intelligent Transportation Systems: Smart and Green Infrastructure Design. McGraw-Hill, 2019.

2.R. E. Brydia, Introduction to Intelligent Transportation Systems. Artech House, 2013.

Reference Books

1. Choudury M A and Sadek A, "Fundamentals of Intelligent Transportation Systems Planning" Artech House,2003.
2. Pradip Kumar Sarkar, Amit Kumar Jain, "Intelligent Transport Systems", PHI Learning Publisher,2018.
3. Kan Paul Chen, John Miles, "Recommendations for World Road Association (PIARC)" ITS Hand Book 2000.
4. Sussman, J. M., "Perspective on ITS", Artech House Publishers, 2005.
5. US Department of Transportation, "National ITS Architecture Documentation", 2007 (CDROM).
6. Turban. E and Aronson. J. E, "Decision Support Systems and Intelligent Systems", 7th Edition, Pearson Publisher,2004.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/105107210
- https://www.civil.iitb.ac.in/tvm/nptel/591_ITS_1/web/web.html

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

- Seminars/Quiz (To assist in GATE Preparations)
- Self-Study on simple topics
- Simple problems solving using Excel
- Discussion of case studies
- Virtual Lab experiments

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Numerical Methods in Civil Engineering (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	BCV604B	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

1. To learn various numerical techniques.
2. To solve Numerical differentiation and integration problems.
3. Apply numerical techniques to solve civil engineering problems.

Module-1

Introduction: Historical development of Numerical techniques, role in investigations, research and design in the field of civil engineering development of algorithm/ flow charts for following methods for the solution of linear simultaneous equation- Gaussian elimination method, Gauss-Jordan matrix inversion method, Gauss-Siedel method and Factorization method.

Module-2

Application Of Root Finding To Civil Engineering Problems: Development of algorithm for Bisection method. Newton-Raphson method and its applications for solution of nonlinear algebraic and transcendental equations from problems in hydraulics, irrigation engineering, structural engineering and

Module-3

Numerical Differentiation: Introduction, expression of derivatives by finite difference: backward differences, forward differences, and central differences. Application of finite difference method for analysis of statically determinate beams, statically indeterminate beams, Buckling of columns, Beams on elastic foundation.

Module-4

Computational Methods: NewMark's method for computation of slopes and deflections in statically determinate beams. Development of algorithm and application of solution of ordinary differential equation to civil engineering problems by Euler's method, Runge Kutta 4thorder method.

Module-5

Numerical Integration: Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method – Two-point and three-point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules. Trapezoidal rule, Simpson's one-third and their application for computation of area of BMD drawn for statically determinate beams.

Course outcome

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

CO 1: Develop algorithms to solve linear equations using numerical methods.

CO 2: Apply numerical methods to solve nonlinear equations in civil engineering.

CO 3: Analyze beams and columns using the finite difference method.

CO 4: Implement numerical methods to solve differential equations in structural analysis.

CO 5: Compute areas under Bending Moment Diagrams using numerical integration.

Suggested Learning Resources:

Text Books

1. Grewal. B.S. and Grewal. J.S., “Numerical methods in Engineering and Science”, 11th Edition, Khanna Publishers,New Delhi,2013
2. Gerald. C. F., and Wheatley. P. O., “Applied Numerical Analysis”,7th Edition, Pearson Education, Asia, New Delhi,2007.
3. Chapra. S.C. and Canale. R. P., "Numerical Methods for Engineers” 7th Edition , Tata McGraw Hill, New Delhi,2016

Reference books

1. Brian Bradie. "A friendly introduction to Numerical analysis", Pearson Education, Asia, New Delhi,2007
2. Sankara Rao. K., "Numerical methods for Scientists and Engineers", 4th Edition, Prentice Hall of India Private, New Delhi,2018

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/111107105
- https://www.coursera.org/learn/numerical-methods-engineers
- https://cosmolearning.org/courses/numerical-methods-and-programing/video-lectures/.

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

- solving civil engineering problems

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Applied Geotechnical Engineering (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	BCV604C	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

1. Learn various methods of soil exploration and sampling techniques.
2. Analyze stress distribution in soils due to different loading conditions.
3. Comprehend the lateral earth pressure theories and their application.
4. Understand the various theories of slope stability.
5. Learn the serviceability of single and group of piles.

Module-1

Soil Exploration: Introduction, Objectives and Importance, Stages and Methods of exploration- Test pits, Borings, stabilization of boreholes, Sampling techniques, Undisturbed, disturbed and representative samples, sample disturbance and Bore hole log.

Module-2

Stresses in Soil: Geodesic stress and Stress due to structures, Boussinesq's Stress distribution for point load, line load and uniformly distributed loads, Newmark's Chart, Contact Pressure, Pressure bulbs.

Module-3

Lateral Earth Pressure: Active, Passive and earth pressure at rest, Rankine's theory for cohesionless and cohesive soils, Factors influencing lateral earth pressure.

Module-4

Stability of Slopes: Assumptions, infinite and finite slopes, factor of safety, Swedish slip circle method for C and C-ø (Method of slices) soils, Fellineous method for critical slip circle, use of Taylor's stability charts. Causes for slope instability, Methods of stabilization of slopes.

Module-5

Pile foundations: uses of piles, classification of piles. Bearing capacity of single pile in clay and sand [I.S. Static formulae], Dynamic formulae (Modified Hiley formulae only), Numerical Problems, I.S. Pile load test- Negative skin friction, Group action, Group efficiency.

Course outcome

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

CO 1: Plan site investigation programs, using different exploration methods and sampling techniques.

CO 2: Compute the vertical stress and settlement of the soil subjected to different loadings

CO 3: Analyze the lateral earth pressure using Rankine's theory.

CO 4: Assess the stability of slopes using various methods.

CO 5: Compute the efficiency of vertically loaded piles.

Suggested Learning Resources:

Books

1. Murthy V.N.S., "Principles of Soil Mechanics and Foundation Engineering", CBS Publishers and Distribu tors, New Delhi,2018
2. K.R. Arora, "Soil Mechanics and Foundation Engineering",7th Edition, Standard Publisher Distributors, NewDelhi,2019.
3. PC Varghese, "Foundation Engineering", PHI India Learning Private Limited, NewDelhi,2000.

Reference Book

1. Punmia BC, "Soil Mechanics and Foundation Engineering", 16th edition, Laxmi Publications co., New Delhi,2017.

Web links and Video Lectures (e-Resources):

- Online study material
- NPTEL video lectures.

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

- Site visit to understand the practical difficulty in construction of earth retaining structures
- Assignment to students on design of an earth retaining structures

B.E CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

Hydro Informatics and modelling (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	BCV604D	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE	50
Total Number of Contact Hours	40	Exam	3 Hours

Course Objectives:

This course will enable students to:

1. Understand comprehensive treatise on remote sensing and Geographic Information System and Hydro-Informatics
2. Apply systems approach on hydrologic systems for modelling hydrological processes
3. Gain knowledge on database management and data handling
4. Model watersheds and analyze watersheds for water resources management
5. Compute statistics of hydrological models using soft computing techniques.

Module – 1

Introduction to Hydro-informatics and Hydrological Models: Overview of Hydro-informatics and Its Role in Water Resources Management, Water Information Systems, Water Quality and Quantity Monitoring Systems.

Hydrological Models: Classification and Types, Model Calibration, Validation, and Sensitivity Analysis, Simple Watershed Modeling: Basic Hydrological Processes (Rainfall-Runoff, Infiltration, Evapotranspiration etc.

Module – 2

Data Handling and Analysis in Hydro-informatics: Types of Hydrological Data, Data Collection Techniques, Data Aggregation and Preprocessing: Time Series Data, Missing Data Handling, Methods of Data Transformation and Standardization, Statistical Analysis of Hydrological Data: Descriptive Statistics, Correlation, Regression, Time Series Analysis: Trends, Seasonal Patterns, and Anomalies, Hydrological Data Visualization: Graphical and Statistical Methods

Module – 3

Hydrological Data Models and Machine Learning: Overview of Hydrological Data Models, Conceptual Models, Black-Box Models, and Hybrid Models

Introduction to Machine Learning in Hydro-informatics: Supervised and Unsupervised Learning, Regression Models in Hydrology: Linear,

Non-Linear, and Multiple Regression, ML for Hydrological Forecasting: Decision Trees, Random Forest, Neural Networks and Deep Learning, Model Calibration and Validation in Machine Learning Models

Module – 4

Geographic Information Systems (GIS) in Hydro-informatics: Introduction to Geographic Information Systems (GIS) and Remote Sensing, Spatial Data Types: Raster vs. Vector Data, GIS Data Collection and Integration in Hydrology: Hydrological Features, Topography, Land Use, Delineation: Methodologies and Tools, Spatial Analysis Techniques: Buffering, Overlay, and Spatial Interpolation, Applications of GIS in Water Resource Planning and Management.

Module – 5

Application of Hydrological Models: Model Selection Criteria for Different Applications, Watershed Modeling for Flood Forecasting and Drought Monitoring, Role of Hydro-informatics in Decision Support Systems (DSS), Integration of Hydrological Models with Water Resources Management, Data Collection and Analysis for Water Resources Planning, Optimization Techniques for Water Allocation and Distribution, Water Demand Forecasting and Supply Management.

Course outcomes:

The students will be able to:

CO 1: Comprehend the use of hydro-informatics in hydrological modelling

CO 2: Apply statistical methods on hydrological data for decision-making.

CO 3: Use machine learning techniques to develop hydrological forecasting models.

CO 4: Illustrate GIS and remote sensing tools for watershed management and water resources planning.

CO 5: Examine applications of hydrological models for water resources planning and management.

Teaching Practice:

- Classroom teaching (chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Alternate Assessment Methods:

→ Seminar
→ Assignment
→ Minor-Project

Text Books

1. Praveenkumar, Alameda J, Bajcsy. P, Hydroinformatics, Taylor & Francis.
2. Chang, K. Introduction to Geographic Information Systems, Tata McGraw Hills Edition, New Delhi
3. Vedula S. and Mujumdar P.P.,Water Resources Systems: Modeling Techniques andAnalysis', Tata-McGraw Hill, 2005.

Reference Books:

1. Abrahart, Robert J., Linda M. See, and Dimitri P. Solomatine, eds. Practical hydroinformatics: computational intelligence and technological developments in water applications. Vol. 68. Springer Science & Business Media, 2008.
2. Eslamian, Saeid, and Faezeh Eslamian, eds. Handbook of hydroinformatics: volume ii: advanced machine learning techniques. Elsevier, 2022.
3. Hydroinformatics Applications of Machine Learning, Data Analysis, and Modeling: Machine Learning and Optimization for Water Resources

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

Air Pollution and Control Technologies (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	BCV604E	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

1. Identify the contemporary air pollution issues.
2. Analyze the major air pollutants and its effect on human health and environment.
3. Infer upon feasibility of the regulations and policies to manage air pollution.
4. Distinguish between technologies used to control and remove air pollutants.

Module – 1

Introduction to Air Pollution: Global Societal concerns, Economic aspects of air pollution prevention and control, Worldwide opportunities as consultant in air pollution mitigation. Air Pollutants- Definition, Sources, classification and characterization, effects of air pollution on Human health, vegetation and materials**.** Industrial Accidents - Meuse Valley Disaster, Bhopal Gas Tragedy, Chernobyl Disaster etc. Air pollution Episodes (case studies)- Acid Rain, Global Warming, Smog, Ozone layer depletion etc.

Module – 2

Atmospheric motion and pollutant transport: Types of inversion, Temperature Lapse Rate & Atmospheric Stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Concept of maximum mixing depth and ventilation coefficient. Plume rise and Effective stack height. Estimation of effective stack height and mixing depths. Effect of wind, topography, terrain and structure on Pollutant dispersion, its applications and limitations. Introduction to Gaussian Plume model and GLC determination.

Module – 3

Automobile Air Pollution: Sources, effects, standards and control methods.

Noise Pollution: Sources, Effects and Control Measures.

Indoor Air Pollution: Sources, Effects, Control Measures and Concepts.

Module – 4

Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SO_X, NO_X, CO, NH_3).

Control Techniques: Particulate matter and gaseous pollutants - Working of settling chambers, cyclone separators, scrubbers, filters & Electrostatic Precipitator along with applications.

Module – 5

Policies and Tools for monitoring Air Quality: Air Quality index and Comprehensive Environmental Pollution Index. National Ambient Air Quality Standards. Emission Standards and Inventory. Salient features of legislations on Air Quality. Kyoto Protocol and Montreal Protocol. Geneva Convention on Long-Range Transboundary Air Pollution. e ASEAN Agreement on Transboundary Haze Pollution.

Course Outcomes: The students will be able to:

CO 1: Understand the sources, causes and effects of air pollution.

CO 2: Analyze the extent of Impact of Air Pollution with the application of air quality models.

CO 3: Comprehend the sources, effects and control of Automobile, Noise and Indoor air pollution.

CO 4: Understand the measurement of the concentration of pollutants and control techniques.

CO 5: Identify policies and legislations at National and Global level for air pollution control.

Textbooks:

1. M N Rao and H VN Rao, Air pollution, 1st Edition, Tata Mc-Graw Hill, 1989.
2. K. Wark, C.F. Warner and W.T. Davis, Air Pollution Control: its Origin and Control, Addision-Wesley, 1998.
3. Daniel Vallero, Fundamentals of Air Pollution. 4th Edition, Academic Press, Burlington, MA, 2008.

References:

4. De Nevers N., Air Pollution Control Engineering, 3rd Edition, Waveland Press Inc, 2016.
5. Robert Maynard, Stephen Holgate, Hillel Koren and Jonathan Samet, Air Pollution and Health, 1st Edition, Academic Press, 1999.
6. Atmospheric Chemistry and Physics, by John Seinfeld and Spyros Pandis, John Wiley & Sons, 1997.
7. Atmospheric Pollution: History, Science, and Regulation, by Mark Z. Jacobson, Cambridge University Press, Cambridge, 2002.

1. S.H. Holgate, J.M. Samet, H.S. Koren, and R.L. Maynard, Air Pollution and Health, Eds., Academic Press, 1999.
2. Rajni Kant and Keshav Kant, Air Pollution and Control Engineering, 1st Edition, Khanna Publishers, 2019.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Water conservation and Rainwater Harvesting (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	BCV605A	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

1. Appreciate basic concepts of Water and its importance.
2. Learn elementary knowledge of ground water.
3. Conceptually learn various theories related to Groundwater recharge and Groundwater recharge
4. Study about Subsurface investigation of Ground water.

Module-1

Water and its importance: Monsoon– types and behavior in India, rainfall – characteristics and distribution, onset and withdrawal of effective rains, dry spells and wet spells, critical dry spells, water loss from the soil, measurement and factors, hydrological cycle, Importance and issues relating water status Scenario of water in Karnataka: sources, geographical distribution, quality. Water (hydrological) cycle, influence of human activity on the water cycle, Surface water resources.

Module-2

Rain water harvesting: Water harvesting: need, principles of water harvesting, general water harvesting methods - rain water harvesting - methods, classes, benefits, approach, rooftop rainwater harvesting, calculation of roof top rain water for harvesting

Module-3

Groundwater recharge: Factors affecting groundwater recharge, techniques for ground water recharge. Preparation of suitable technical drawing and design of rain water harvesting structure and ground water recharge. Water quality and its impact on human beings.

Module-4

Conservation of water: Importance, knowledge regarding conservation/saving of water in daily use, in agriculture in industries. Water Conservation strategies- Limiting the consumption, Reuse and recycling, Elimination of losses, pollution prevention.

Module-5

Ground water exploration and management: Geophysical methods and its importance. Present law regarding water management Water footprints- Blue water footprint, green water footprint, grey water footprint. Sustainability assessment.

Course outcome

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

CO 1: Illustrate hydrological cycle and importance of water.

CO 2: Comprehend principles and methods of rain water harvesting.

CO 3: Design roof top rain water harvesting structures for ground water recharge.

CO 4: Summarize strategies for water conservation.

CO 5: Outline ground water exploration and water footprints.

Suggested Learning Resources:

Books

1. Rainwater Harvesting and Conservation Manual, CPWD,2019
2. A practical guide on Roof Top Rain Water Harvesting, WASH Institute,2016
3. Patel, A S , "Water Management : Conservation, Harvesting and Artificial Recharge", New Age International (P) Ltd., Publishers, (2017)
4. Sumita Dasgupta, Gita Kavarana ,"Catch Water Where It Falls - Toolkit on Urban Rainwater Harvesting" ,Centre for Science and Environment (2013)
5. Novak Celeste Allen, 'Designing Rainwater Harvesting Systems", John Wiley & Sons Inc, (2014)

Web links and Video Lectures (e-Resources):

- NPTEL and YouTube Videos.

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

- Visit to water conservation and harvesting site

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Satellite Remote Sensing and GIS (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	BCV605B	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to:

1. Comprehend the basic concepts of remote sensing.
2. Analyze satellite imagery and extract the required information
3. Extract the GIS data and prepare the thematic maps.
4. Use the thematic maps for various applications

Module – 1

Introduction: Relevance in the Global scenario. Financial bearing on the World Economy. Role in Environmental and Societal concerns. Internship and Job opportunities. Significance and application of the course in Civil Engineering.

Remote Sensing: Basic concept of Remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, and vegetation), Resolution, image registration and Image and False color composite, elements of visual interpretation techniques.

Applications: The above topic is required for concept of remote sensing.

Module – 2

Remote Sensing Platforms and Sensors: Indian Satellites and Sensors characteristics, Remote Sensing Platforms, Sensors and Properties of Digital Data, Data Formats: Introduction, platforms IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. sensors, sensor resolutions (spatial, spectral, radiometric and temporal). Basics of digital image processing- introduction to digital data, systematic errors(Scan Skew, Mirror-Scan Velocity, Panoramic Distortion, Platform Velocity , Earth Rotation) and non-systematic [random] errors(Altitude, Attitude). Image enhancements (Gray Level Thresholding, level slicing, contrast stretching), image filtering.

Applications: The above topic is required for different platform and sensor in satellites

Module – 3

Geographic Information System: Introduction to GIS; components of a GIS; Geographically Referenced Data, Spatial Data- Attribute data-Joining Spatial and attribute data, GIS Operations: Spatial Data Input – Attribute data Management, Geographic coordinate System, Datum; Map Projections: Types of Map Projections, Projected coordinate Systems. UTM Zones.

Applications: The above topic is required for processing satellite imageries.

Module – 4

Data Models: Vector data model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape file; Relational Database, Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, and Data conversion.

Applications: The above topic is required for creating different thematic maps

Module – 5

Integrated Applications of Remote sensing and GIS: Applications in land use land cover analysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management. Location Based Services and Its Applications. Bhuvan website satellite imagery download and Google Earth integrating imageries.

Applications: The above topic is required for planning and implementation**.**

Course outcomes: The students will be able to:

CO 1: Comprehend the remote sensing concepts, process and energy interaction with water and soil.

CO 2: Apply the knowledge of sensors to identify the different ground features

CO 3: Analyse the different thematic maps and process the satellite imageries

CO 4: Propose the data structures to data conversion and creating different data models.

CO 5: Identify and integrate the data models for urban planning and natural resource management.

Teaching Practice:

- Classroom teaching (chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Textbooks

1. Narayan Panigrahi, "Geographical Information Science", and ISBN 10: 8173716285 / ISBN 13:9788173716287, University Press2008.
2. Basudeb Bhatta, "Remote sensing and GIS" , ISBN:9780198072393, Oxford University Press2011
3. Kang – T surg Chang, "Introduction to Geographic Information System". Tata McGraw Hill Education Private Limited2015.
4. Lilles and, Kiefer, Chipman,"RemoteSensingandImageInterpretation",Wiley2011.

References

1. 1. Chor Pang Lo and Albert K.W Yeung, "Concepts &Techniques of GIS", PHI,2006
2. John R. Jensen, "Remote sensing of the environment", an earth resources perspective–2nd edition– by Pearson Education2007.
3. Anji Reddy M., "Remote sensing and Geographical information system", B. S. Publications2008.
4. Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, "Principals of Geo physical Information system", Oxford Publications2004.
5. S Kumar,"Basics of remote sensing & GIS", Laxmi publications 2005

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Integrated Waste Management for a Smart City (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	BCV605C	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

1. To introduce the fundamentals of Solid Waste Management
2. To provide details of Sustainable Cities
3. Understand the Sustainable Development Goals.

Module-1

Introduction: Solid Waste Properties, types and Quantities generation rates and waste composition; Integrated waste management issues, collection, recovery, reuse, recycling, energy-from-waste, and landfilling.

Module-2

Biological treatment of the organic waste fraction: Sources, direct land application, composting, and anaerobic digestion. Biochemical Processes and Composting Energy Recovery from Municipal Solid Waste.

Module-3

Solid Waste Management: Sources, types, Effects and disposal methods, Current Issues in Solid Waste Management and Review of MSW Management, MSW Rules 2016, Swachh Bharat Mission and Smart Cities Program, Status in First List of 20 Smart Cities in the Country.

Module-4

Construction and Demolition (C&D) Waste Management: Sources, types, Effects and disposal methods, Overview C&D Waste – Regulation, Beneficial Reuse of C&D Waste Materials.

Module-5

Electronic Waste (E-Waste) Management: Sources, types, Effects and disposal methods, Issues and Status in India and Globally, E-Waste Management Rules 2016.

Course outcome

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

CO 1: Outline types of solid waste and their properties.

CO 2: Analyze the physical and biochemical characteristics of the waste for its treatment and disposal.

CO 3: Identify relevant policies for solid waste management in urban areas and Smart Cities.

CO 4: Comprehend handelling of C&D waste management and reuse strategies.

CO 5: Examine E-waste management and related regulations.

Suggested Learning Resources:

Books

1. William A Worrell and P. Aarne Veslind Solid Waste Engineering, 2nd Edition (SI Edition) Cengage Learning, 2012.
2. George Tchobanoglous, Hilary Theisen and Samuel A Vigil, “Integrated Solid Waste management”, 2nd Edition, McGraw Hill,1993.

Reference Books

3. Manual on Solid Waste Management, prepared by The Central Public Health and Environmental Engineering Organization(CPHEEO), India
4. MSW Management Rules 2016, Govt. of India, available online at CPCB website.
5. Electronic Waste Management Rules 2016, Govt. of India, CPCB website.

Web links and Video Lectures (e-Resources):

• NPTEL VIDEOS.
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Visit to landfill and waste management site

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Sustainable Development and Goals (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	BHS605A	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

1. To introduce engineering students to the principles of sustainable development and the United Nations Sustainable Development Goals (SDGs).
2. To explore the role of engineering solutions in addressing global sustainability challenges.
3. To integrate sustainability concepts into engineering design, innovation, and problem-solving.
4. To develop critical thinking skills for assessing the environmental, social, and economic impacts of engineering projects.
5. To encourage ethical responsibility and leadership in advancing sustainability in engineering practices.

Module-1

Foundations of Sustainable Development in Engineering: History and evolution of sustainable development, the 17 UN Sustainable Development Goals (SDGs) and their relevance to engineering, the role of engineers in global sustainability, Systems thinking and life-cycle perspectives in engineering projects.

Module-2

Engineering for Environmental Sustainability: Climate change and renewable energy solutions, Green infrastructure and sustainable construction techniques, Waste management: Circular economy, recycling, and upcycling, Environmental Impact Assessment (EIA) and carbon footprint analysis.

Module-3

Sustainable Design, Materials & Technologies: Eco-friendly materials and sustainable manufacturing, Smart cities, energy-efficient systems, and green buildings, Water resource management and clean technologies, Application of AI, IoT, and data analytics in sustainability

Module-4

Socio-Economic Aspects & Ethical Responsibility: The role of engineering in poverty reduction, clean water access, and health (SDGs 1, 3, 6), Ethical implications and Corporate Social Responsibility (CSR) in engineering, Community-based engineering solutions and stakeholder engagement, Policy frameworks and regulations affecting engineering practices.

Module-5

Innovation, Case Studies & Future Trends: Real-world case studies of engineering solutions advancing SDGs, Barriers to implementing sustainable engineering projects, Emerging trends: Renewable energy, smart grids, and carbon-neutral cities, The engineer's role in the post-2030 sustainability agenda.

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

CO 1: Demonstrate a comprehensive understanding of the SDGs, their targets, and indicators.

CO 2: Recognize the role of engineering in promoting sustainability and addressing global challenges.

CO 3: Propose engineering solutions that contribute to the achievement of one or more SDGs.

CO 4: Apply systems thinking to design sustainable engineering solutions that address multiple SDGs simultaneously.

CO 5: Comprehend an ethical mindset and social responsibility toward sustainable development in engineering practices through teamwork and collaboration.

Suggested Learning Resources:

Books

1. United Nations SDGs (www.un.org/sustainabledevelopment)
2. "Engineering for Sustainable Development: Guiding Principles" (Royal Academy of Engineering)
3. Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep Chachra, P.S. Janaki Krishna "Smart Cities for Sustainable Development" Springer, 2022.
4. "The Sustainable Development Goals Report" 2020 Kindle Edition, Department of Economic and Social Affairs"
5. The Sustainable Development Goals" Hardcover,United Nations, 2018

Web links and Video Lectures (e-Resources):

- NPTEL VIDEOS.

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

- Visit to Industry to understand sustainability goals adopted

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Occupational Safety and Health Monitoring (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	BCV605D	CIE Marks	50
Teaching Hours/Week (L: T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

1. To discuss the role of health and safety in the workplace pertaining to the responsibilities of workers, managers, and supervisors.
2. To evolve decisions required to maintain the workplace health and safety.
3. To identify and control hazards in the workplace that pose a danger or threat to safety and health.
4. To gain historical, economic, and organizational perspective of occupational safety and health.
5. To demonstrate the knowledge and skills needed to identify workplace problems and safe work practice.

Module-1

Evolution, Policies and Norms: History and Development, Occupational Safety and Health Act ~ 1970, Rights and Responsibilities of Employee and Employer, Accident Investigation Plan, Accident Causation Models, Methods of acquiring accident facts, Supervisory role and requisites in accident investigation, India's National Policy on EHS at Workplace ~ 2009.

Module-2

Hazard Analysis: Ergonomics Task Analysis, Job Hazard Analysis, Fault Tree Analysis, Hazard cognition and analysis & Human Error Analysis.

OSH and Indoor Air Quality: Sick Building Syndrome, Indoor Air Quality Standards.

Module-3

Fire Safety: Fire Triangle & Tetrahedron, Classification of Fire, Classification of Fire Extinguishers, Fire Development and its Severity, Early detection of Fire, Emergency Action Plans - Exit Routes & Confined Spaces.

Electrical Safety: Product Safety and Process Safety.

Module-4

Occupational Safety and Health Management Systems: Safety Management Plan as part of ISO 45001:2018 & OHSAS 18001, Principles of Industrial Hygiene, Relevance of Record Keeping & Labelling, Personal Protective Equipment/Clothing: Types and Salient Features. Hierarchy of Controls.

Module-5

OSH considerations at Workplace: Municipal Solid Waste Management Plant, Water and Wastewater Treatment Plants, Chemical-based Labs, Cement Manufacturing Plants, Construction Sites, Workplaces linked to Infectious Diseases,

Course outcome

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

CO 1: Appreciate the significance of OSH Norms, Policies, Procedures and relevant Act's towards attaining workplace safety.

CO 2: Analyse for types of Hazards at workplaces.

CO 3: Identify salient features and mitigative measures mandated for Fire-based and Electrical-related hazards.

CO 4: Evaluate the strengths and gaps of various OSH management systems.

CO 5: Distinguish between OSH aspects for various workplaces

Suggested Learning Resources:

Test Books

1. Goetsch D. L., "Occupational Safety and Health for Technologists, Engineers and Managers", 8th Edition, Prentice Hall,2014
2. Heinrich H.W. "Industrial Accident Prevention-A Scientific Approach", McGraw-Hill Book Company National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1959),
3. "Industrial Safety and Pollution Control Handbook.

Reference Books

1. Colling D.A., "Industrial Safety Management and Technology", Prentice Hall, New Delhi,1990
2. Della D.E., and Giustina, "Safety and Environmental Management", Van Nostrand Reinhold
   International Thomson Publishing Inc,1996

Web links and Video Lectures (e-Resources):

- https://www.cdc.gov/niosh/index.htm
- https://nptel.ac.in/courses/114106017
- https://youtu.be/8nbOI-0U9Co
- https://youtu.be/Be9inw8xlw8
- https://youtu.be/n7oUOUCIblg
- https://youtu.be/gzgNLvHTrfY
- https://www.slideshare.net/engkhanmsh/introduction-to-osha-50289682

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

- http://nptel.ac.in
- https://swayam.gov.in

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Software Application Lab (0:0:1) 1

(Effective from the academic year 2024-25)

Course Code	BCVL607	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	03

Course objectives:

1. Use industry standard software in a professional set up.
2. Understand the elements of finite element modelling, specification of loads and boundary condition, performing analysis and interpretation of results for final design.
3. Develop customized automation tools.

SLNO	Experiments
1	Analysis of plane trusses, continuous beams using softwares
2	Analysis of portal frames using software
3	Understanding basic features of Project management software. Constructing Project: create WBS, Activities, and tasks and Computation Time using Excel spread sheet and transferring the same to Project management software.
4	Identification of Predecessor and Successor activities with constrain. Constructing Network diagram (AON Diagram) and analyzing for Critical path,
5	Critical activities and Other non-Critical paths, Project duration, Floats. Study on various View options available
6	Basic understanding about Resource Creation and allocation g. Understanding about Splitting the activity, Linking multiple activity, assigning Constrains, Merging Multiple projects, Creating Baseline Project
7	GIS applications using open source software: To create shape files for point, line and polygon features with a map as reference. To create decision maps for specific purpose.
8	Computation of earthwork, Design of horizontal curve by offset method, Design of super elevation Using Excel
	Demonstration Experiments (For CIE)
9	Creating structural model and analysis of high rise structures
10	Creating a model of building and the effect of earth quake
11	Create a model of large span roof and analyse
12	Crate a plan and set of structural drawings for a multi-storied building

Course outcome

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

CO 1: Use software for analysis and design of structural elements.

CO 2: Design using excel spread sheet

CO 3: Modelling of structural elements of buildings

Suggested Learning Resources:

- Training manuals and User manuals and Relevant course reference books

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Building Information Modelling in Civil Engineering - Advanced (0:0:1) 1

(Effective from the academic year 2024-25)

Course Code	BCV608A	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	02

Course objectives:

1. Understand the concept of Building Information Modelling
2. Create the workflow followed in industry during creation of BIM 3D model which includes
3. Building the discipline-based model and create the federated models

SL NO	Exercise
1	Creating A Basic 3D BIM Model
2	Starting Systems Projects
3	working with view and Setting up Spaces
4	Introduction to Revit MEP
5	HVAC Networks
6	Scheduling
7	Electrical Systems
8	Scheduling and Creating sheets
9	Plumbing Networks
10	Scheduling

Module	Experiment No.	Experiment Title	Steps to Complete the Experiment
Module 1: 3D BIM & Modeling Fundamentals	1	Creating a Basic 3D BIM Model	Introduction to BIM Set up project levels, grids, and reference planes. Model walls, floors, roofs, windows, and doors. Apply materials and textures. Export the model in IFC format.
	2	Structural & Architectural Component Modeling	Linking and Importing CAD Files Linking in Revit Models Setting Up Levels Copying and Monitoring Elements Coordinating Linked Models Batch Copying Fixtures
Module 2: Introduction to Revit MEP	3	working with view and Setting up Spaces	Modifying the View Display Duplicating Views Adding Callout Views Creating Elevations and Sections
	4	Introduction to Revit MEP	Introduction to Revit MEP Linking projects View templates

Module	Experiment No.	Experiment Title	Steps to Complete the Experiment
Module 3: HVAC Networks	5	Networks	Adding Mechanical Equipment and Air Terminals Adding Ducts, flex duct, Modifying Ducts, duct fittings, placing mechanical components
	6	Scheduling	Duct Schedules air terminal schedule, Setting Up Sheets, Placing and Modifying Views on Sheets, Printing Sheets
Module 4: Electrical	7	Electrical Systems	About Electrical Systems Placing Electrical Components Creating Electrical Circuits Setting up Panel Schedules Adding Cable Trays and Conduit Testing Electrical Layouts
	8	Scheduling and Creating Sheet	Scheduling conduit Schedules cable tray schedule Creating sheets Setting Up Sheets Placing and Modifying Views on Sheets Printing Sheets
Module 5: Plumbing	9	Plumbing Networks	Adding connectors, Plumbing Fixtures and Equipment Adding Plumbing Pipes Modifying Plumbing Pipes, pipe fittings
	10	Scheduling	pipe Schedules Setting Up Sheets Placing and Modifying Views on Sheets Printing Sheets

Course outcome

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

CO 1: Develop and integrate 3D BIM models with structural components for improved visualization and coordination. (Expts 1 & 2)

CO 2: Implement working space for efficient project scheduling and logistics. (Expts 3 & 4)

CO 3: Build HVAC network system and Scheduling of a project. (Expts 5 & 6)

CO 4: Create an Electrical network system and Scheduling of a project. (Expts 7 & 8)

CO 5: Design a Plumbing network system and Scheduling of a project. (Expts 9 & 10)

Suggested Learning Resources:

Books

1. Rafael Sacks," BIM Handbook"3rd Edition, Wiley,2018.
2. Brad Hardin (Author), Dave McCool," BIM and Construction Management: Proven Tools, Methods, and Workflows",2nd Edition, Wiley,2015.

Reference Books

1. ISO 19650 - Building Information Modelling (BIM)
2. BIM Handbook – Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston
3. "Building Information Modeling" – Willem Kymmell
4. "BIM and Construction Management: Proven Tools, Methods, and Workflows" – Brad Hardin & Dave McCool
5. "BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors" – Chuck Eastman, Paul Teicholz, Rafael Sacks, and Kathleen Liston "Digital Twin Technologies and Smart Cities" – F. J. Villanueva

Web links and Video Lectures (e-Resources):
• E-learning content on L&T EduTech Platform. • Autodesk BIM 360 – https://www.autodesk.com/bim-360/ • Graphisoft BIMcloud – https://graphisoft.com/bimcloud • Building Smart International – https://www.buildingsmart.org/ • National Institute of Building Sciences (NIBS) – https://www.nibs.org/ • Digital Twin Consortium – https://www.digitaltwinconsortium.org/ •
Video Lectures
• Coursera – "BIM Fundamentals for Engineers" (By National Taiwan University) • https://www.coursera.org/learn/bim-fundamentals • MIT OpenCourseWare – "Building Technology" • https://ocw.mit.edu/courses/architecture/ • Autodesk University – BIM & Digital Twin Tutorials • https://www.autodesk.com/autodesk-university • YouTube – "The B1M" (Popular BIM and Construction Channel) • https://www.youtube.com/c/TheB1M • LinkedIn Learning – "BIM Management and Execution" • https://www.linkedin.com/learning

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Structural Health Monitoring Using Sensors (1:0:0) 1

(Effective from the academic year 2024-25)

Course Code	BCV608B	CIE Marks	50
Teaching Hours/Week (L:T:P)	1:0:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	03

Course objectives:

1. To provide an understanding of the principles of SHM and its importance in the field of civil engineering.
2. To familiarize students with different types of sensors used in SHM and their principles of operation
3. To teach students how to design and implement a sensor-based monitoring system for a civil engineering structure.
4. To provide students with the knowledge of data acquisition, processing, and analysis techniques for SHM.
5. To demonstrate the application of SHM in the assessment of civil engineering structures

Module-1

Introduction on SHM: Introduction to Structural Health Monitoring, Definition and importance of SHM in civil engineering, History and evolution of SHM,SHM system components and their functions.

Module-2

Types of Sensors for Structural Health Monitoring: Overview of different types of sensors, Principles of operation and selection of sensors for different structures, Advantages and disadvantages of different sensors, SHM using Optical Fibres and other sensors.

Module-3

Structural Health Monitoring and Smart Materials: Structural Health Monitoring versus Non Destructive Evaluation, Health Monitoring and Demolition Techniques, Long term health monitoring techniques, Understanding Piezoelectric materials.

Module-4

Design of Sensor-based Monitoring System: System design considerations, Sensor placement and installation, System calibration and validation.

Module-5

Applications of Structural Health Monitoring: Monitoring of buildings, bridges, and dams, Case studies of SHM applications in civil engineering, Future trends and challenges in SHM.

Course outcome

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

CO 1: Explain the fundamentals, importance, and evolution of Structural Health Monitoring (SHM).

CO 2: Identify different types of sensors, their working principles, and their suitability for SHM.

CO 3: Differentiate SHM from Non-Destructive Evaluation and analyze smart materials used in monitoring.

CO 4: Design a sensor-based monitoring system, including placement, calibration, and validation.

CO 5: Apply SHM techniques to real-world structures and evaluate future trends and challenges.

Suggested Learning Resources:

Books

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, “Structural Health Monitoring”, John Wiley and Sons, 2006
2. Douglas E Adams, “Health Monitoring of Structural Materials and Components”, John Wiley and Sons, 2000
3. E-resources 1. E-learning content on L&T EduTech Platform

Web links and Video Lectures (e-Resources):

- L&T EduTech Lecture Videos.

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

- Site visit to understand the structural health monitoring systems

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Finishing School for Civil Engineering (0:0:1) 1

(Effective from the academic year 2024-25)

Course Code	BCV608C	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	02

Course objectives:

1. Comprehend fundamentals of building design.
2. Emphasis on suitable structural scheme and integrated design concepts.
3. Utilise software applications for designing RCC structures.
4. Cognizance in Modeling, Analysis & Design.
5. Impart knowledge on construction and management in building construction

SL NO	Experiments
1	Preparation of a Suitable Building Plan [Framed Structure] as per the Client Requisites and Approval Style Drawing following the By Laws.
2	Structural Analysis and Design of the Building by Using Software Computation and Manual Calculations.
3	Preparation of Detailed Estimate and Abstract following the latest Schedule of Rates and also, preparation of Bar Bending Schedule.
4	Preparation of Structural and Working Drawings. Drafting and Detailing.
5	Construction Project Management with Schedule using Software.

Course outcomes:

The students will be able to:

CO 1: Apply the acquired Engineering Knowledge to Plan and Execute Construction of Building as an individual and team.

CO 2: Perform Analysis per the code specifications and prepare the report comprehensively to communicate efficiently.

CO 3: Record the observations and Draft the Detailing of Drawings as per requirements

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Occupational Safety and Health Aspects in Civil Engineering (1:0:0) 1

(Effective from the academic year 2024-25)

Course Code	BCV608D	CIE Marks	50
Teaching Hours/Week (L: T:P)	1:0:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	01

Course objectives:

1. To discuss the role of health and safety in the workplace pertaining to the responsibilities of workers, managers, and supervisors.
2. To evolve decisions required to maintain the workplace health and safety.
3. To identify and control hazards in the workplace that pose a danger or threat to safety and health.
4. To gain historical, economic, and organizational perspective of occupational safety and health.
5. To demonstrate the knowledge and skills needed to identify workplace problems and safe work practice.

Module-1

Policies and Norms: Rights and Responsibilities of Employee and Employer, Accident Causation Models, Methods of acquiring accident facts, Supervisory role and requisites in accident investigation, India's National Policy on EHS at Workplace ~ 2009.

Module-2

Hazard Analysis: Ergonomics Task Analysis, Job Hazard Analysis

OSH and Indoor Air Quality: Sick Building Syndrome, Indoor Air Quality Standards.

Module-3

Fire Safety: Fire Triangle & Tetrahedron, Classification of Fire, Classification of Fire Extinguishers, Fire Development and its Severity, Early detection of Fire, Emergency Action Plans - Exit Routes & Confined Spaces.

Module-4

Occupational Safety and Health Management Systems: OHSAS 18001, Hierarchy of Controls, Personal Protective Clothing: Types and Salient Features.

Module-5

OSH considerations at Workplace: Municipal Solid Waste Management Plant, Water and Wastewater Treatment Plants, Environmental Engineering based Labs, Cement Manufacturing Plants, Construction Sites.,

Course outcome

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

CO 1: Appreciate the significance of OSH Policies & Procedures towards attaining workplace safety.

CO 2: Analyse for types of Hazards at workplaces.

CO 3: Identify salient features and mitigative measures mandated for Fire-based hazards.

CO 4: Evaluate the strengths and gaps of various OSH management systems.

CO 5: Distinguish between OSH aspects for civil engineering-based workplaces.

Suggested Learning Resources:

Test Books

4. Goetsch D. L., "Occupational Safety and Health for Technologists, Engineers and Managers", 8th Edition, Prentice Hall,2014
5. Heinrich H.W. "Industrial Accident Prevention-A Scientific Approach", McGraw-Hill Book Company National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1959),
6. "Industrial Safety and Pollution Control Handbook.

Reference Books

3. Colling D.A., "Industrial Safety Management and Technology", Prentice Hall, New Delhi,1990
4. Della D.E., and Giustina, "Safety and Environmental Management", Van Nostrand Reinhold
   International Thomson Publishing Inc,1996

Web links and Video Lectures (e-Resources):

- https://www.cdc.gov/niosh/index.htm
- https://nptel.ac.in/courses/114106017
- https://youtu.be/8nbOI-0U9Co
- https://youtu.be/Be9inw8xlw8
- https://youtu.be/n7oUOUCIblg
- https://youtu.be/gzgNLvHTrfY
- https://www.slideshare.net/engkhanmsh/introduction-to-osha-50289682

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

- http://nptel.ac.in
- https://swayam.gov.in

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Drone Surveying (1:0:0) 1

(Effective from the academic year 2024-25)

Course Code	BCV608E	CIE Marks	50
Teaching Hours/Week (L:T:P)	1:0:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	03

Course objectives:

1. Explain the fundamentals of Drone surveying.
2. Describe the Methods of Surveying with Drone.
3. Explain the concepts of Image processing and Photogrammetry.
4. Explain Modelling with Drones.
5. Discuss the Drone applications.

Module-1

INTRODUCTION TO DRONE SURVEYING: Introduction to Drones, History of Drone/UAS/UAVs, payload, battery life, Specs for good results, Regulations of DGCA and Drone license, Pre and Post Flight planning- Flight execution and photography, data collection- Image Format, GSD, Scale and Resolutions.

Module-2

SURVEYING WITH DRONE: Consideration for hardware selections, comparison on surveying drone and its accuracy, Techniques of controlling errors, Consideration of GCP in vertical and horizontal accuracies, Planning and estimation of drone surveying jobs, Autonomous flight vs. manual and hybrid flight profiles.

Module-3

IMAGE PROCESSING AND PHOTOGRAMMETRY: Aerial Triangulation, post processing softwares, Analyzing Data, Contouring, DEM, DSM, Cut, Fill, and Volumetric Measurement Calculation and orthophoto generation.

Module-4

MAPPING AND MODELING: Introduction to mapping and modeling concepts, Understanding RTK, PPK and GCP's, Overview of popular data processing software platforms and functions**.**

Module-5

APPLICATIONS: Application of drone for Surveying & Mapping-Construction, Irrigation and Agricultural, Engineering Land Survey and Transportation.

Course outcome

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

CO 1: Comprehend Drone Fundamentals and Regulations.

CO 2: Evaluate and Select Appropriate Surveying Hardware.

CO 3: Perform Aerial Triangulation and Data Processing.

CO 4: Understand Mapping and Modelling Techniques.

CO 5: Apply Drone Technology in Various Industries.

Suggested Learning Resources:

Books

1. Lillesand and Kiefer, "Remote Sensing and Image Interpretation", 5th Edition, published by John Wiley and Sons, 2008.
2. One Nation Under Drones: Legality, Morality, and Utility of Unmanned Combat Systems by John E. Jackson.
3. A.M. Chandra, S.K. Ghosh, "Remote Sensing and Geographical Information System", Narosa Publishing house, 1st Edition, 2007.

Reference Books:

1. Lillesand and Kiefer, "Remote Sensing and Image Interpretation", 5th Edition, published by John Wiley and Sons, 2008.
2. One Nation Under Drones: Legality, Morality, and Utility of Unmanned Combat Systems by John E. Jackson.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Introduction to Generative AI for Civil Engineering (0:0:2) 1

(Effective from the academic year 2024-25)

Course Code	**BCV608F**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	0:0:2	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	3

Course objectives:

1. Develop proficiency in utilizing advanced AI tools like ChatGPT, Copilot, Elicit, and QuillBot, along with data visualization software Power BI, to enhance various aspects of civil engineering tasks, including design optimization, simulation, and analysis.
2. Cultivate the ability to brainstorm, generate, and refine innovative solutions for civil engineering challenges such as structural design, traffic flow management, smart city planning, and environmental impact assessment.
3. Gain expertise in collecting, synthesizing, visualizing, and analyzing data to inform and support critical decisions in civil engineering projects, ensuring efficiency, sustainability, and resilience.

Exercise

1. Structural Design Optimization: Use ChatGPT to brainstorm and refine design ideas, and Power BI to visualize and analyze structural data.
2. Traffic Flow Simulation: Utilize Copilot to write and debug code for traffic flow simulations, and Power BI to create interactive dashboards for traffic data analysis.
3. Smart City Planning: Employ Elicit to gather and synthesize research on smart city components, and Power BI to visualize city planning data.
4. Earthquake-Resistant Structures: Use ChatGPT to generate design concepts and Power BI to analyze and present structural performance data.
5. Water Distribution Network: Develop models using Copilot to assist with coding and simulations, and Power BI to visualize water distribution efficiency.
6. Construction Scheduling: Utilize QuillBot to refine project documentation and Power BI to create and manage construction schedules.
7. Environmental Impact Assessment: Use Elicit to gather environmental impact data and Power BI to analyze and present the findings.
8. Material Selection: Employ ChatGPT to generate material selection criteria and Power BI to compare and visualize material properties.
9. Flood Risk Management: Use Copilot to assist with coding flood risk models and Power BI to visualize flood risk data.
10. Urban Heat Island Mitigation: Utilize ChatGPT to brainstorm mitigation strategies and Power BI to analyze and present urban heat island data.

Course outcome

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

1. Demonstrate the ability to effectively use AI tools like ChatGPT, Copilot, Elicit, and QuillBot, as well as Power BI, to support and enhance engineering tasks, from concept generation to data analysis and project management.
2. Apply creative and innovative thinking to develop practical solutions for complex civil engineering problems, considering factors such as sustainability, safety, and efficiency.
3. Exhibit competence in collecting, analyzing, and visualizing data to make informed decisions that improve the planning, design, and implementation of civil engineering projects.

Suggested Learning Resources:

Text Books:

1. ChatGPT for Beginners: Features, Foundations, and Applications by Eric Sarrion
2. ChatGPT for Beginners: A Practical Guide for Using AI for Everyday Tasks by Luke Ditchburn
3. Introducing Microsoft Power BI by Alberto Ferrari and Marco Russo
4. Mastering Microsoft Power BI: Expert Techniques for Effective Data Analytics and Business Intelligence by Brett Powell
5. Microsoft Power BI Complete Reference by Devin Knight

Reference Books:

1. Microsoft Copilot Guidebook: Transform Your Workflow with an Easy Guide for AI-driven Solutions by Ryson Thalian
2. Enhancing Research Efficiency in Small and Medium Business Enterprises (SMEs) Through Elicit Application by Varun Gupta, Joel V. A. Corera, and Chetna Gupta
3. Free Citation Generator: APA, MLA & Chicago Style by QuillBot
4. How to Cite a Book in APA Style | Format & Examples by Nicole Routh

Web links and Video Lectures (e-Resources):

ChatGPT

1. https://www.msn.com/en-in/general/general/chatgpt-101-simplified-guide-on-how-to-use-the-ai-tool/ar-AA1zXNlk?form=MG0AV3
2. https://www.youtube.com/watch?v=t1-5z0HgkuE

Copilot

1. https://www.computerworld.com/article/1611598/microsoft-copilot-tips-how-to-use-copilot-right.html?form=MG0AV3
2. https://learn.microsoft.com/en-us/copilot/?form=MG0AV3

Elicit

1. https://www.youtube.com/watch?v=rJJPS-EvNfk
2. https://www.youtube.com/watch?v=3AkDT4S5Dlg
3. https://www.fahimai.com/how-to-use-elicit?form=MG0AV3

QuillBot

1. https://www.youtube.com/watch?v=IMWZi7JKteA
2. https://www.youtube.com/watch?v=cZT9J8IygIA

PowerBI

1. https://learn.microsoft.com/en-us/power-bi/fundamentals/desktop-getting-started?form=MG0AV3
2. https://www.youtube.com/watch?v=TmhQCQr_DCA
3. https://learn.microsoft.com/en-us/power-bi/fundamentals/service-get-started?form=MG0AV3

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

NSS (0:0:0)

(Common to all branches)

(Effective from the academic year 2024-25)

Course Code	**BNSK609**	CIE Marks	100
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of degree)

Course Objectives: National Service Scheme (NSS) will enable the students to:

1. Understand the community in general in which they work.
2. Identify the needs and problems of the community and involve them in problem solving.
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
5. Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

Module – 1

Introduction to NSS

History and growth of NSS, Philosophy of NSS, Objectives of NSS, Meaning of NSS Logo, NSS Programs and activities, administrative structure of NSS, Planning of programs / activities, implementation of NSS programs / activities, National & State Awards for NSS College / Program Officer / Volunteers.

Module – 2

Overview of NSS Programs

Objectives, special camping – Environment enrichment and conservation, Health, Family, Welfare and Nutrition program. Awareness for improvement of the status of women, Social Service program, production-oriented programs, Relief & Rehabilitation work during natural calamities, education and recreations, Selection of the problem to be addressed.

Module – 3

NSS Activities - Group Contributions to Society / community (Activity based Learning)

Organic Farming, Indian agriculture (Past, Present, Future) Connectivity for marketing, Waste management– Public, Private and Govt. organization, 5 R's. Water conservation techniques – role of different stakeholders – implementation, preparing an actionable business proposal for enhancing the village income and approach for implementation. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.

Module – 4

NSS National Level Activities for Society / Community at large (Activity based Learning)

Developing Sustainable Water management system for rural areas and implementation approaches. Contribution to any national level initiative of Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.

Module – 5

NSS Individual Activities for Local Voice (Activity based learning)

Govt. school Rejuvenation and helping them to achieve good infrastructure, Plantation and adoption of plants. Know your plants. Spreading public awareness under rural outreach programs, National integration and social harmony events.

Course outcomes :

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

CO 1: Understand the importance of his / her responsibilities towards society.

CO 2: Analyse the environmental and societal problems/issues and will be able to design solutions for the same.

CO 3: Evaluate the existing system and to propose practical solutions for the same for sustainable development.

CO 4: Implement government or self-driven projects effectively in the field.

CO 5: Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Assessment Details

Weightage	**CIE – 100%**
Presentation -1 Selection of topic, PHASE-1	20 Marks
Commencement of activity and its progress – PHASE – 2	20 Marks
Case Study based Assessment – Individual performance	20 Marks
Sector wise study and its consolidation	20 Marks
Video based seminar for 10 minutes by each student at the end of the course with Report	20 Marks

Suggested Learning Resources:

Books:

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

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

Sports (0:0:0)

(Common to all Branches)

(Effective from the academic year 2024-25)

Course Code	**BPEK609**	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	--
Total Number of Contact Hours	26	Exam Hours	--

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of degree)

Course Objectives: The course will enable students to

1. Develop a healthy life style.
2. Acquire Knowledge about various stages of sports and games.
3. Focus on modern technology in sports.

Module – 1

Introduction of the game: Aim of sports and games, Brief history of the game, Nature of the game, Terminology & Modern trends of the game, Fitness & Skill tests along with Game Performance.

Module – 2

Offensive and Defensive Techno Tactical Abilities: Fitness, Fundamentals & Techniques of the game with the implementation of Biomechanics, Tactics- Drills for the Techno Tactical abilities, Individual and Group, Miner games- to implement the Techniques, Tactics and Motor abilities.

Module – 3

Team tactics and Rules of the Game: Rules and Regulations of the Game: Game rules as well as sequence of officiating, Team tactics: Offensive and Defensive team strategies and scrimmages, Practice Matches: among the group, Analysis of Techno Tactical abilities: Correction and implementation of skills and Sports Injuries and rehabilitation: First aid, PRICE treatment.

Module – 4

Sports Training: Introduction of Sports Training, Principles of Sports performance, how to increase and sustain the sports performance, Training Load & Recovery- How to increase the training load (volume/Intensity) and means and methods for Recovery, Periodization: Shorts, Medium and Long term, Physiological changes: Changes in Lung capacity, heart beats etc.

Module – 5

Organization of Sports Event: Tournament system, Planning and preparation for the competition, Ground preparation and Equipment's, Organizing an event among the group.

The above 5 modules are common to all the sports events / games, we are offering the following games: 1. Baseball, 2. Kabaddi, 3. Table Tennis, and 4. Volleyball.

Course outcomes:

The students will be able to:

- **CO 1:** Understand the importance of sports and games, inculcate healthy habits of daily exercise & fitness, Self-hygiene, good food habits, Create awareness of Self-assessment of fitness.
- **CO 2:** Develops individual and group techno tactical abilities of the game.
- **CO 3:** Increases the team combination and plan the strategies to play against opponents.
- **CO 4:** Outline the concept of sports training and how to adopt technology to attain high level performance.
- **CO 5:** Summarize the basic principles of organising sports events and concept of technology implemented to organise competitions in an unbiased manner.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation and video analysing.
- Practical classes in outdoor and indoor as per requirement.

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.
- CIE 2 for 60 marks – A practical test conducted at the end of the semester in which the student has to give fitness and skill tests and his performance in game will be assessed.

Textbooks

1. Barbara Bushman, "ACSM's complete guide to Fitness & Health", 2011, Human Kinetics USA
2. Pankaj Vinayak Pathak, "Sports and Games - Rules and Regulation", 2019, Khel Sahitya Kendra.
3. Hardayal Singh, "Sports Training, General Theory & Methods", 1984 "Netaji Subhas, National Institute of Sports".
4. Keith A. Brown, "International Handbook of Physical Education and Sports Science", 2018, (5 Volumes) Hardcover.

References

1. Tudor O Bompa," Periodization Training for Sports", 1999, Human Kinetics, USA
2. Michael Boyle, "New Functional Training for Sports" 2016, Human Kinetics USA 3. Michael Kjaer, Michael Rogsgaard, Peter Magnusson, Lars Engebretsen &
3 more, "Text book of Sports Medicine: Basic Science and Clinical Aspects of Sports Injury and Physical Activity", 2002, Wiley Blackwell.
4. Scott L. Delp and Thomas K. Uchida, "Biomechanics of Movement: The Science of Sports, Robotics, and Rehabilitation", 2021, The MIT Press
5. MCARDLE W.D. "Exercise Physiology Nutrition Energy And Human Performance" 2015, LWW IE (50)

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

Yoga (0:0:0)

(Common to all Branches)

(Effective from the academic year 2024-25)

Course Code	**BYOK609**	CIE Marks	100
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Course Objectives:

This course will enable students to:

2. Understand the importance of practicing yoga in day-to-day life.
3. Be aware of therapeutic and preventive value of Yoga.
4. Have a focussed, joyful and peaceful life.
5. Maintain physical, mental and spiritual fitness.
6. Develop self-confidence to take up initiatives in their lives.

Module – 1

Introduction to Yoga: Introduction, classical and scientific aspects of yoga, Importance, Types, Healthy Lifestyle, Food Habits, Brief Rules, Sithalikarana Practical classes.

Module – 2

Physical Health: Introduction, Pre-requisites, Asana-Standing, Sitting, Supine and Prone, Practical classes.

Module – 3

Psychological Health: Introduction Thought Forms, Kriya (Kapalabhati), Preparation to Meditation, Practical classes.

Module – 4

Therapeutic Yoga: Mudra Forms, Acupressure therapy, Relaxation techniques Practical classes.

Module – 5

Spirituality & Universal Mantra: Introduction, Being Human, Universal Mantra, Universal LOVE, Benefits of practice of Spirituality in day-to-day life, practical classes.

Course Outcomes:

Students will be able to:

CO 1: Understand the requirement of practicing yoga in their day-to-day life.
CO 2: Apply the yogic postures in therapy of psychosomatic diseases
CO 3: Train themselves to have a focussed, joyful and peaceful life.
CO 4: Demonstrate the fitness of Physical, Mental and Spiritual practices.
CO 5: Develops self-confidence to take up initiatives in their lives.

Teaching Practice:

- Classroom teaching (Chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.
- CIE 2 for 60 marks – A practical test conducted at the end of the semester in which the student have to perform asanas.

Textbooks

1. George Feuerstein: The yoga Tradition (Its history, literature, philosophy and practice.)
2. Sri Ananda: The complete Book of yoga Harmony of Body and Mind. (Orient paper Backs: vision Books Pvt.Ltd., 1982.

3. B.K.S Iyenkar: Light on the Yoga sutras of patanjali (Haper Collins Publications India Pvt.,Ltd., New Delhi.)
4. Science of Divinity and Realization of Self – Vethathiri Publication, (6-11) WCSC, Erode

References

1. Principles and Practice of Yoga in Health Care, Publisher: Handspring Publishing Limited, ISBN: 9781909141209, 9781909141209
2. Basavaraddi I V: Yoga in School Health, MDNIY New Delhi, 2009
3. Dr. HR. Nagendra: Yoga Research and applications (Vivekanda Kendra Yoga Prakashana Bangalore)
4. Dr. Shirley Telles: Glimpses of Human Body (Vivekanda Kendra Yoga Prakashana Bangalore)

Web resources

Web links and Video Lectures (e-Resources): Refer links

1. https://youtu.be/KB-TYlgd1wE
2. https://youtu.be/aa-TG0Wg1Ls

Course outcomes:

The students will be able to:

CO1: Develop qualities like character, comradeship, discipline, leadership, secular outlook, spirit of adventure, ethics and ideals of selfless service.
CO2: Get motivated and trained to exhibit leadership qualities in all walks of life and be always available for the service of the nation.
CO3: Familiarize on the issues related to social & community development and disaster management and equip themselves to provide solutions.
CO4: Get an insight of the defense forces and further motivate them to join the defense forces.

Teaching Practice:

- Blackboard/Multimedia Assisted Teaching.
- Class Room Discussions, Brainstorming Sessions, Debates.
- Activity: Organizing/Participation in Social Service Programs.

On Ground: Drill training.

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.
- CIE 2 for 60 marks – A practical test conducted at the end of the semester.

Textbooks:

1. NCC Cadets Handbook –Common Directorate General of NCC, New Delhi.
2. NCC Cadets Handbook –Special(A), Directorate General of NCC, New Delhi.

References:

- Chandra B. Khanduri, “Field Marshal KM Cariappa: a biographical sketch”, Dev Publications,2000.
- Gautam Sharma, “Valour and Sacrifice: Famous Regiments of the Indian Army”, Allied Publishers,1990.

B.E. CIVIL ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – VI

NCC (0:0:0)
(Common to all Branches)
(Effective from the academic year 2024-25)

Course Code	BNCK609	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Mandatory Course (Non-Credit)
(Completion of the course shall be mandatory for the award of degree)

Course Objectives:
This course will enable students to:
- Understand the vision of NCC and its functioning.
- Understand the security set up and management of Border/Coastal areas.
- Acquire knowledge about the Armed forces and general awareness.

Module– 1

Introduction to National Cadet Corp: What is NCC, who can join NCC, benefits, Establishment, history, 3 wings, motto, core values, Aims, flag, song, pledge, cardinals, Organization, Director General NCC, Directorates, Uniform and Cadet ranks, Camps, Certificate exams, Basic aspects of drill.
National Integration: Importance of national integration**,** Factors affecting national integration, Unity in diversity**,** Role of NCC in nation building.
Disaster Management: What is a Disaster**,** Natural and Man-made disasters**,** Earthquake, Floods.

Module– 2

Indian Army: Introduction to Indian Army, Command and control, Fighting & supporting arms**,** Rank structure, Major Regiments of the Army**,** Major Wars and Battles**,** Entry to the Indian Army, Renowned leaders and Gallantry Awardees.

Module– 3

Indian Air Force: Introduction to Indian Air Force, Command and control**,** Rank structure**,** Major Aircrafts, Entry to the Indian Air Force, Renowned leaders.

Indian Navy: Introduction to Indian Navy, Command and control, Rank structure, Major Ships and Submarines**,** Entry to the Indian Navy, Renowned leaders.

Module– 4

Health and Hygiene: First Aid Protocols - CPR, Understanding Types of Bandages, Fire Fighting
Field & Battle Crafts: Field Signals using hands, Judging distance -Types of Judging Distance, Section formations-types of Section Formation

Module– 5

Drill Practicals: Savdhan, Vishram, Salute, Turning, Marching.

Course outcomes:

The students will be able to:

CO 1: Develop qualities like character, comradeship, discipline, leadership, secular outlook, spirit of adventure, ethics and ideals of selfless service.

CO 2: Get motivated and trained to exhibit leadership qualities in all walks of life and be always available for the service of the nation.

CO 3: Familiarize on the issues related to social & community development and disaster management and equip themselves to provide solutions.

CO 4: Get an insight of the defense forces and further motivate them to join the defense forces.

Teaching Practice:

- Blackboard/Multimedia Assisted Teaching.
- Class Room Discussions, Brainstorming Sessions, Debates.
- Activity: Organizing/Participation in Social Service Programs.

On Ground: Drill training.

CIE: 100 Marks

- CIE 1 for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester.

CIE 2 for 60 marks – A practical test conducted at the end of the semester.

Textbooks:

3. NCC Cadets Handbook –Common Directorate General of NCC, New Delhi.
4. NCC Cadets Handbook –Special(A), Directorate General of NCC, New Delhi.

References:

- Chandra B. Khanduri, "Field Marshal KM Cariappa: a biographical sketch", Dev Publications,2000.

Gautam Sharma, "Valour and Sacrifice: Famous Regiments of the Indian Army", Allied Publishers,1990.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

Music (0:0:0)

(Common to all Branches)

(Effective from the academic year 2024-25)

Course Code	BMUK609	CIE Marks	100
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	-
Total Number of Contact Hours	26	Exam Hours	-

Mandatory Course (Non-Credit)

(Completion of the course shall be mandatory for the award of the Degree)

Course Objectives:

The course will enable the students to:

1. Identify the major traditions of Indian music, both through notations andaurally.
2. Analyze the compositions with respect to musical and lyrical content.
3. Demonstrate an ability to use music technology appropriately in a variety ofsettings.

Module – 1

Preamble: Contents of the curriculum intend to promote music as a language to developan analytical, creative, and intuitive understanding. For this the student must experiencemusic through study and direct participation in improvisation and composition.

Origin of the Indian Music: Evolution of the Indian music system, Understanding of Shruthi, Nada, Swara, Laya, Raga, Tala, Mela.

Module – 2

Compositions: Introduction to the types of compositions in Carnatic Music - Geethe, JathiSwara, Swarajathi, Varna, Krithi, and Thillana, Notation system.

Module – 3

Composers: Biography and contributions of Purandaradasa, Thyagaraja, Mysore Vasudevacharya.

Module – 4

Music Instruments: Classification and construction of string instruments, wind instruments, percussion instruments, Idiophones (Ghana Vaadya), Examples of each class of Instruments

Module – 5

Abhyasa Gana: Singing the swara exercises (Sarale Varase Only), Notation writing for Sarale Varase and Suladi Saptha Tala (Only in Mayamalavagowla Raga), Singing 4 Geethein Malahari, and one Jathi Swara, One Nottu Swara OR One krithi in a Mela raga, a patriotic song

Course Outcomes (COs):

The students will be able to:

CO 1: Discuss the Indian system of music and relate it to other genres (CognitiveDomain)

CO 2: Experience the emotions of the composer and develop empathy (AffectiveDomain)

CO 3: Respond to queries on various patterns in a composition (Psycho-Motor Domain)

Teaching Practice:

- Classroom teaching
- ICT – PowerPoint Presentation

Audio & Video Visualization Tools

CIE: 100 Marks

- **CIE 1** for 40 marks – A theory paper which is MCQ / Descriptive conducted during the semester

CIE 2 for 60 marks – A practical test conducted at the end of the semester in which the student has to recite one Sarale Varase mentioned by the examiner in three speeds. Sing / Play the Geethe in Malahari. Singing / Playing Jathi Swara / Krithi.

Textbooks

1. Vidushi Vasantha Madhavi, "Theory of Music", Prism Publication, 2007.
2. T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana - Vol. 1 (English), Shreenivaasa Prakaashana, 2018.

References

1. Lakshminarayana Subramaniam, Viji Subramaniam, "Classical Music of India: A Practical Guide", Tranquebar 2018.
2. R. Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019.
3. Ethel Rosenthal, "The Story of Indian Music and Its Instruments: A Study of the Present and a Record of the Past", Pilgrims Publishing, 2007.

Carnatic Music, National Institute of Open Schooling, 2019.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

INDIAN KNOWLEDGE SYSTEM (0:0:0)

(Common to All UG Programs)

(Applicable for the Academic Year 2024-25 for 2022 scheme onwards)

Course Code	**BIKS610**	CIE Marks	100
Teaching Hours/Week (L: T:P)	1:0:0- NCMC	SEE Marks	-
Total Number of Lecture Hours	13	Total marks	100

Course objectives:

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyse it and apply it to their day-to-day life.

Module – 1

Introduction to Indian Knowledge Systems (IKS): Overview, Vedic Corpus, Philosophy, Character, scope and importance, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge.

Module – 2

Traditional Knowledge in Humanities and Sciences: Linguistics, Number and measurements-Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology.

Module – 3

Traditional Knowledge in Professional domain: Town planning and architecture-Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals.

Course Outcomes: After completing the course, the students will be able to

CO1:	Provide an overview of the concept of the Indian Knowledge System and its importance.
CO2:	Appreciate the need and importance of protecting traditional knowledge.
CO3:	Recognize the relevance of Traditional knowledge in different domains.
CO4:	Establish the significance of Indian Knowledge systems in the contemporary world.

Reference Books:

1	**Introduction to Indian Knowledge System- concepts and applications**, B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R N, 2022, PHI Learning Private Ltd, ISBN-978-93-91818-21-0
2	**Traditional Knowledge System in India**, Amit Jha, 2009, Atlantic Publishers and Distributors (P) Ltd., ISBN-13: 978-8126912230,
3	**Knowledge Traditions and Practices of India**, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334,

Suggested Web Links:

1.	**https://www.youtube.com/watch?v=LZP1StpYEPM**
2.	**http://nptel.ac.in/courses/121106003/**
3.	http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63 (Centre of Excellence for Indian Knowledge System, IIT Kharagpur)
4.	https://www.wipo.int/pressroom/en/briefs/tk_ip.html
5.	https://unctad.org/system/files/official-document/ditcted10_en.pdf
6.	http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf
7.	https://unfoundation.org/what-we-do/issues/sustainable-development-goals/?gclid=EAIaIQobChMInp-Jtb_p8gIVTeN3Ch27LAmPEAAYASAAEgIm1vD_BwE