

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

III and IV Semester Scheme and Syllabus 2022 Scheme - Autonomous

Approved in the BoS meeting held on 13.10.2023

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.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT



(An Autonomous Institution Affiliated to VTU, Belagavi) Avalahalli, Doddaballapur Main Road, Bengaluru – 560064

Date: 16.10.2023

CONTINUOUS INTERNAL EVALUATION AND SEMESTER END EXAMINATION PATTERN: 2022 BATCH ONWARDS

All students of 2022 scheme onwards are hereby informed to note the following with reference to Continuous internal evaluation and Semester end examination: The Weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The Minimum passing mark for the CIE is 40% of the Maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

	IPCC COURSES: 4 CREDITS AND 3 CREDITS								
Evaluatio	on Type	Internal Assess ments (IAs)	Test/ Exam Marks Conducted for	Marks to be scale down to	Min. Marks to be Scored	Evaluation Details			
	CIE – IA	CIE – Test 1 (1.5 hr)	40			Average of two internal assessment tests each of 40 marks, scale down the			
	Tests	CIE – Test 2 (1.5 hr)	40	15	00	marks scored to 15 marks			
Theory Component	CIE – CCAs (Compreh	CCA -1	10			Any two assessment methods as per clause 220B4.2 of regulations (if			
	ensive Continuo us Assessme nt)	CCA-2	10	10	04	assessment is project based, then one assessment method may be adopted)			
Total CIE T		C Theory		25	10	Scale down marks of tests and CCAs to 25			
	CIE - Practical		-	15	06	Conduction of experiments and preparation of laboratory records etc.			
Practical Component	CIE Practic	CIE Practical Test		10 '	04	One test after all experiment's to be conducted for 50 marks			
	Total CIE Practical			25	10	Scale down marks of experiments, record and test to 25			
Total CIE Theory + Practical				50	20				
SEE		-	100	50	18	SEE exam is a theory exam, conducted for 100 marks, scored marks are scaled to 50 marks			
(m)1 · · ·	CIE + SEE			100	40				
The minimun	n marks to be	e secured in	I CIE to appe	ar for SEE	shall be 10) (40% of maximum marks-			

The minimum marks to be secured in CIE to appear for SEE shall be 10 (40% of maximum marks-25) in the theory component and 10 (40% of maximum marks -25) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only.

Profe	Professional Core Course (PCC) courses: 03 and 02 Credit Courses							
Internal Evaluation Type Assessment (IAs)		Internal Assessments (IAs)	Test/ Exam Marks Conduct ed for	Marks to be scale down to	Min. Marks to be Scored	Evaluation Details		
	CIE –	CIE – Test 1 (1.5 hr)	40			Average of two internal assessment		
	IA Tests	CIE – Test 2 (1.5 hr)	40	25	10	tests each of 40 marks, scale down the marks scored to 25 marks.		
Component	CIE - CCAs	CCA -1	25	25	10	Any two assessment methods as per clause 220B4.2 of regulations (if it is		
		CCA-2	25			project based, one CCA shall be given)		
	Total	CIE Theory		50	20			
SEE			100	50	18	SEE exam is a theory exam, conducted for 100 marks, scored marks are scaled down to 50 marks		
CI	E + SEE	}		100	40			

	NON IPCC COURSES: 01 Credit Courses-MCQ								
Evaluation Type		Internal Assessments (IAs)	Test/ Exam Marks Cond ucted for	Marks to be scale down to	Min. Marks to be Scored	Evaluation Details			
Operations	CIE – IA	CIE – Test 1 (1 hr)	40			Average of two internal assessment			
Continu ous Internal Evaluati	Tests (MCQs)	CIE – Test 2 (1 hr)	40	25	10	marks, scale down the marks scored to 25 marks			
on Compon ent	CIE - CCAs	CCA -1	25	25	10	Any two assessment methods as per clause 220B4.2 of			
	CONS	CCA-2	25			regulations			
	Tota	1 CIE Theory		50	20				
SEE (MCQ Type)				50	18	MCQ-type question papers of 50 questions with each question of 01 mark, examination duration is 01 hour			
	CIE +	SEE		100	. 40				

]	Professional Core Course Laboratory (PCCL) course- 01 credit							
Evaluation Type	Internal Assessments (IAs)	Test/ Exam Marks Conducted for	Marks to be scale down to	Min. Marks to be Scored	Evaluation Details			
Continuous	CIE - Practical		30		Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments shall be approved by the PAC and are made known to students at the beginning of the practical session. Record should contain all the specified experiments in the syllabus. Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).			
Continuous Internal Evaluation	CIE Practical Test	100	20		Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus. In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce. The suitable rubrics can be designed to evaluate each student's performance and learning ability by PAC. The marks scored shall be scaled down to 20 marks (40% of the maximum marks).			
	Total CIE	-	50	20				
Semester End Examination		100	50	18	General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result - 60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (Rubrics shall be approved by the PAC)			
CIEt	OLL	100	ວບ	40				

	Computer Aided Engineering Drawing (BCEDK103/BCEDK203): 3 credit							
Eval	luation Type	Topics/Modules	Computer Printout	Preparatory Sketch	Max Marks	Total Marks	Marks to be Scaled Down to	Min Marks to Pass
		Projection of Points	10	05	15		00 20	08
		Projection of Lines	10	10	20			
	Sketchbook	Projection of Planes	20	15	35			
	Modelling	Projection of Solids	40	20	60	- 200		
CIE		Isometric Projections	20	15	35			
а. А		Development of lateral surfaces	20	15	35			
	Tost 1	Module 1 & 2	24	06	30	70		
	Iest I	Module 3	32	08	40	70	00	
	Tost O	Module 3	32	08	40	70	20	08
	Iest 4	Module 4	24	06	30	70		
	CCA 1	Module 5	08	02	10	10	10	04
	CCA 2	Module 5	08	02	10	10	10	04
			CIE Total	A CONTRACTOR OF CONTRACTOR			50	20
		Module 1 & 2	24	06	30			
	SEE	Module 3	32	08	40	100	50	20
		Module 4	24	06	30			
		CII	E + SEE				100	40

	Computer Aided Modelling for Manufacturing (BME305): 1 credit							
Eva	luation Type	Module	Computer Printout	Preparatory Calculations / Sketch	Max Marks	Total Marks	Marks to be Scaled Down to	Min Marks to Pass
	Sketchbook	Module 1	60	30	90			
	and CAD	Module 2	40	20	60	200	20	08
	Modeling	Module 3	40	10	50			
	Test 1	Module 1	20	10	30	60	20	08
CIE		Module 2	20	10 '	30	00		
	Test 2	Module 1	20	10	30	60	20	
	1030 2	Module 3	20	10	30	00		
	CCA	Module 1	30	10	40	40	10	04
			Total CI	£			50	20
SEE		Module 1	30	10	40		_	
		Module 2	20	10	30	100	50	20
		Module 3	20	10	30			
			CIE + SEE				100	40

220B 4.2 Continuous Internal Evaluation (CIE)

1) For a theory course, with an L-T-P distribution of L-0-0, the CIE will carry a maximum of 50% weightage of the total marks of a course. Before the start of the Academic session of each Semester, a faculty may choose for his course Internal Assessment Test and a minimum of two of the following assessment methods with suitable weightage for each

i) Assignments (Individual and /or Group)

ii) Seminars

iii) Oral/ Online Quizzes

iv) Group Discussions

v) Case studies/ Case lets

vi) Practical orientation on Design Thinking, Creativity & Innovation

vii) Participatory & Industry – integrated learning

viii) Practical activities/ problem-solving exercises

ix) Class presentations

x) Analysis of Industry/ Technical/ Business Reports

xi) Reports on Guest Lectures/ Webinars/ Industrial Visits

xii) Industrial/ Social/ Rural projects

xiii) Participation in Seminars/ Academic Events/ Symposia, etc.

xiv) Any other academic activity

- 18/10/2023

Mah Dean (AA) 18.10.2023

Principal

Scheme of III Semester



BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT (Autonomous Institute affiliated to VTU) Scheme of Teaching and Examination: Effective from AY 2023 – 24 Choice Based Credit System (CBCS)

UG PROGRAM: CIVIL ENGINEERING (CV)						1	Semester	r: III														
						Teaching			ts	Examination												
S1. No.	Course category	Course Code	Course Title	Teaching Dept.	F L	Hours/Week		Hours/Week		Hours/Week		Hours/Week		Hours/Week		Credi	Durati on	CIE Marks	SEE Marks	Total Marks		
1	PCC	BCV301	Strength of Materials	CV	3	0	0		3	3	50	50	100									
2	IPCC	BCV302	Engineering Survey	CV	3	0	2		4	3	50	50	100									
3	IPCC	BCV303	Engineering Geology	CV	3	0	2		4	3	50	50	100									
4	PCC	BCV304	Water Supply and Waste water Engineering	CV	3	0	0		3	3	50	50	100									
5	PCCL	BCV305	Computer Aided Building Planning and Drawing	CV	0	0	2		1	3	50	50	100									
6	ESC	BCV306x	ESC/ETC/PLC	CV	3	0	0		3	3	50	50	100									
7	UHV	BSCK307	Social Connect and Responsibility	Any Department	0	0	2		1	1	100		100									
8	AEC/	BCV358x	Ability Enhancement Course/Skill Enhancement		If	the a 1	cou: Theo	rse is ry		1												
	SEC		Course - III		1	0	0		1		50	50	100									
					If	If a course is a		If a course is a		If a course is a		If a course is a		If a course is a		If a course is a		-	0	- 50	50	100
					0		orate	ory	-	2												
		BNSK359	National Service Scheme (NSS)	NSS coordinator																		
9	МС	BPEK359	Physical Education (PE) (Sports and Athletics)	Physical Education Director	0	0	2		0		100		100									
		BYOK359	Yoga	Yoga Teacher																		
		BNCK359	NCC	NCC coordinator	_																	
	<u> </u>	BMUK399	IMUSIC	music reacher	16	0	12	0														
			TOTAL				28	-	20	-	550	350	900									

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L**: Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. K: This letter in the course code indicates common to all the stream of Engineering. ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course

Engineering Science Course (ESC/ETC/PLC)						
BCV306A	Rural, Urban Planning and Architecture	BCV306C	Sustainable Design Concept for Building			
			Services			
BCV306B	Geospatial Techniques in Practice	BCV306D	Fire Safety in Buildings			
	Ability Enha	incement				
	Course	– III				
BCV358A	Data analytics with Excel - IBM	BCV358C	Problem Solving with PYTHON			
BCV358B	Smart Urban Infrastructure	BCV358D	Personality Development for Civil Engineers			

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./ B. Tech.) 2022-23 may please be referred.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between 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. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.

III Semester Syllabus

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - III

Strength of Materials (3:0:0) 3

(Effective from the academic year 2023-24)							
Course Code	BCV301	CIE Marks	50				
Teaching Hours/Week (L: T:P: S)	3:0:0	SEE Marks	50				
Total Number of Contact Hours	40	Exam Hours	3 Hrs.				

Course Learning objectives: This course will enable students to

1. Understand the simple stresses, strains, and compound stresses in various structural components.

- 2. Understand the bending moments and shear forces in different types of beams undervarious loading conditions
- 3. Know the bending stress, shear stress, and torsional stress in beams and shafts withdifferent cross sections
- 4. Understand the deflection in beams and the stability of columns under different loadingconditions.
- 5. Understand the behaviour and strength of structural elements subjected to compound stresses and stresses in thin and thick cylinders.

Module-1

Simple Stresses and Strains: Introduction, Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress – Strain Diagram for structural steel, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections. Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants. Thermal stresses and strains, Compound bars subjected to thermal stresses, state of simple shear. Numerical.

(L1, L2, L3)

Module-2

Bending moment and shear force diagrams in beams: Introduction to types of beams, supports and loadings. Definition of shear force and bending moment, sign convention, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, development of Shear Force Diagram(SFD) and Bending Moment Diagram(BMD) with salient values for cantilever, simply supported and overhanging beams for point loads, UDL (Uniformly Distributed Load), UVL (Uniformly Varying Load), Couple and their combinations. Numerical. **(L1,L2,L3)**

Module-3

Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, T, and T sections. Numerical.

Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation of torsion equation for
circular shafts, torsional rigidity and polar modulus. Numerical.(L1, L2, L3)

Module-4

Deflection of Beams: Definition of slope, Deflection and curvature, Sign conventions, Derivation of momentcurvature equation. Double integration method and Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple. Numerical. **Columns and Struts:** Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Numerical. **(L1,L2,L3)**

Module-5

Compound Stresses: Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses. Numerical.

Thin and Thick Cylinders: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lame's equation, radial and hoop stress distribution. Numerical. (L1,L2,L3)

Course outcome

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

CO1: Evaluate the simple stresses, strains and compound stresses

- CO2: Calculate the Bending moments, shear force and draw BMD, SFD for various types ofbeams and loadings
- CO3: Analyse the bending stress, shear stress and torsional stress in beams and shafts withdifferent cross sections
- CO4: Evaluate the deflection in beams and determine the stability of the columns.
- CO5: Evaluate the behaviour and strength of structural elements under the action of compoundstresses and stresses in thin and thick cylinders.

Suggested Learning Resources:

- Text Books
 - B.C Punmia Ashok Jain, Arun Jain, "Strength of Materials", Laxmi 2018-22Publications, 10th Edition-2018
 - R K Bansal, "A Textbook of Strength of Materials", 4th Edition, Laxmi Publications, 2010
 - S.S. Rattan "Strength of Materials" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition(Sixth reprint 2013).
 - Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17thEdition, Khanna Publishers, New Delhi.
 - R.K. Rajput, "Strength of materials" S. Chand Publishing (6th Edition)
 - S S Bhavikatti, "Strength of Materials" Vikas Publishing (5th Edition)
 - B.S. Basavarajaiah, P. Mahadevappa "Strength of Materials" in SI Units, University Press(India) Pvt. Ltd., 3rd Edition,2010

Web links and Video Lectures (e-Resources):

1.Strength of Materials web course by IIT Roorkee <u>https://nptel.ac.in/courses/112107146/</u>
2.Strength of Materials video course by IIT Kharagpur <u>https://nptel.ac.in/courses/105105108/</u>
3.Strength of Materials video course by IIT Roorkee <u>https://nptel.ac.in/courses/112107147/18</u>
4.All contents organized <u>http://www.nptelvideos.in/2012/11/strengthof-materials-prof.html</u>

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

- Quiz (To assist in GATE Preparations)
- Demonstrations in Lab
- Virtual Lab Experiments

	B.E. CIVIL ENGINEERING						
(Choice Based Credit System (CBCS)						
	SEMESTER - III						
	Engineering Survey (3:0:2) 4						
(H	Effective from the academic year 2023-24)						
Course Code	BCV302	CIE Marks	50				
Teaching Hours/Week (L:T:P: S)	3:0:2	SEE Marks	50				
Total Hours of Contact Hours	40 hours Theory + 8-10 Lab slots	Exam Hours	3 Hours				

Course Learning objectives: This course will enable students to

- **1.** Ability to understand principles of both traditional and modern surveying applying knowledge of mathematics.
- **2.** Ability to handle surveying equipment's and software tools to carry out field surveying, plot topographical Drawings and construction drawing
- 3. Ability to use Total station for data capture, data storage, data transfer.
- 4. Ability to prepare construction drawing and setting out

MODULE-1

Engineering surveying – Definition & importance of surveying for Civil Engineers. Surveying types- Control survey, Topographical surveying, Construction Survey, Cadastral survey, Hydrographic survey and Underground Survey. Surveying through the ages- Chain surveying, Compass surveying and Plane Table Surveying (concepts and limitations only).

MODULE-2

Levelling- Concepts of various types of Datum – Mean Sea level, Benchmarks Temporary and Permanent. Terms used in levelling, Setting up of Dumpy level. Differential levelling by plane of collimation method using Dumpy level. Longitudinal and cross sectioning – Definition, importance of L/S & C/S. L/S & C/S using level. Numerical.

Theodolite Surveying – Terms used in Theodolite surveying. Setting up a Theodolite. Measurement of horizontal and vertical angles with Theodolite.

Contours - Definition, terms used, characteristics of contours and applications of contours in civil engineering practice. Contouring using level, theodolite and total station. Plotting of contours in CAD

L1,L2,L3

MODULE-3

Curves –Types of Curves- Application of curves in civil engineering. Setting out of Horizontal curve by Theodolite (Rankine's method) and using Total Station. Components of Compound, Reverse curve. Transition Curve and Combined curve. Various types of vertical curves and its applications.

Areas and Volumes- Methods of determining areas by trapezoidal and Simpsons' rule. Measurement of volume by prismoidal and trapezoidal formula. Earthwork volume calculations from spot levels and from contour maps; Earthwork calculation in Embankment L1,L2,L3

MODULE-4

Total Station Surveying – Features, parts, accessories and advantages of Total Station. Surveying with total station – Measurement of Horizontal angle, vertical angle, distance, slope, vertical distance, multiple angles with Total station. Using Total station for Area measurement and Volume calculation

Coordinate survey with Total station - Measurement of coordinates using total station. CreatingJob files, importance of back sight data, coordinate data recording. Data transferring, data refinement and plotting in CAD.

L1, L2, L3, L4

MODULE-5

GPS Surveying – Introduction. Overview of GPS system- space, control and user segments.Reference coordinate systems. Absolute and Differential positioning with GPS. Gagan system in India. Types of GPS Receivers. Engineering survey using Differential GPS. Electronic Distance meter

Surveying with Drone – Introduction, applications and advantages. Drone surveying requirements- Types of drones and sensors. Application and uses of Remote sensing and GIS in engineering surveying.

	DDAOMICAL COMPONENTA OF IDOO
<u> </u>	PRACTICAL COMPONENT OF IPCC
SI.NO	Experiments
1	Use of Various types of tapes, Laser distance meter, Distance measuring wheel.
2	Differential levelling by Dumpy level by plane of collimation method
3	Measurement of horizontal and vertical angles by Theodolite. Method of repetition
4	Setting out simple curve using Rankine's method using Theodolite
5	Setting out central line of a small residential building.
6	Setting up of Total station. Features and components of Total station
7	Measurement of Distance, slope, vertical distance, horizontal and vertical angles using Total station
8	Coordinate measurement with Total station
9	Longitudinal sectioning and cross sectioning using Total station
10	Contouring and plotting with Total station
11	Demonstration of Equipment's used for chain, compass and plane table surveying
12	Visit to railway station/ large construction site to understand the importance of datum and benchmark.
Course	outcomes
At the e	end of the course, the student will be able to:
CO1: S	Summarize various types of surveying and carry out distance measurement using various
e	quipment's
CO2: I	llustrate the use and applications of levelling and theodolite
CO3: F	Plot contours, longitudinal and cross sections for construction projects.
CO4: S	Set curves for construction works and carry out estimation of areas and volumes.
CO5: I	Demonstrate the necessary skills to carry out GPS and DRONE Surveying
Sugges	ted Learning Resources:
Books	
1. 2. 3.	Punmia BC, & Jain Ashok Kumar. (2016). <i>Surveying</i> (17th ed., Vol. 1). Laxmi Publications. Dr. K.R. Arora. (2019). <i>Surveying</i> (17th ed., Vol. 1). Standard Book House. Charles D. Ghilani. (2012) (13 th ed.). Prentice Hall

Web links and Video Lectures (e-Resources):

- 1. <u>https://enterprise.dji.com/surveying/land-surveying</u>
- 2. <u>https://www.gps.gov/applications/survey/</u>
- 3. <u>https://www.constructionplacements.com/total-station-in-surveying-types-uses-and-applications/</u>
- 4. <u>https://www.youtube.com/watch?v=bbs5AEPstl4</u>
- 5. <u>https://www.youtube.com/watch?v=KHI4TEeexuM&list=PLLy_2iUCG87DwNVc3Mz1yYIRA42jSQ1t</u> <u>B&index=28</u>
- 6. <u>https://www.youtube.com/watch?v=Iu9vrE48_I4&list=PLLy_2iUCG87DwNVc3Mz1yYlRA42jSQ1t</u> <u>B &index=30</u>
- 7. <u>https://www.youtube.com/watch?v=RXUi2cX4CkU</u>
- 8. https://www.youtube.com/watch?v=SVa66vO08So

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

- 1. Hand on use of various surveying instruments
- 2. Surveying Civil engineering block and plotting with instruments of student's choice
- **3.** Setting out a single bedroom house plan in field

	B.E. CIVIL ENGINEERING		
	Choice Based Credit System (CBCS)		
	SEMESTER - III		
	Engineering Geology (3:0:2) 4		
(E	ffective from the academic year 2023-24)		
Course Code	BCV303	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2	SEE Marks	50
Total Number of Contact Hours	40 hours Theory + 8-10 Lab slots	Exam Hours	3 Hours

Course objectives:

- 1. To inculcate the importance of earth's interior and application of Geology in civil engineering in projects such as Dams, Bridges, Tunnels and Highways.
- 2. To provide decision support on the nature of the rocks and minerals as a basic raw materials used in construction.
- 3. To educate the ground water and surface management regarding diversified geological formations and rain water harvesting.
- 4. To understand the application of Remote Sensing and GIS, Natural disaster and management and environmental awareness.

To describe various geological structures and maps and interpretation of geological data for mining and subsurface Investigations.

MODULE-1 7 hrs

Introduction, the scope of earth science in Engineering. Earth's internal structure and composition, internal dynamics and Plate tectonics, Earthquakes - types, causes, so-seismic lines, seismic zonation, seismic proof structures. Volcanic eruption - types, causes. Landslides-causes types, preventive measures; Tsunami – causes, consequences, mitigation. Cyclones - causes and management. **L1, L2, L3**

MODULE-2 5 hrs

Earth Materials in Construction Minerals -Industrial, rock-forming and ore minerals. Physical properties, composition. Rocks Types, structure/Texture, mineral composition occurrence, properties. Decorative (facing/polishing), railway ballast, rocks for masonry work, monumental/architecture, Dressing of stones, Requirement of good building stones. L1, L2, L3

MODULE-3 7hrs

Earth Surface process and Resources Weathering, type, causes, soil insitu, drifted soil, soil profile, soil mineralogy, structure, types of soil, Black cotton soil v/s Lateritic soil; effects of weathering on monumental rocks. Soil Horizon, Soil Classification by Grain Size. L1, L2, L3

MODULE-4 7 hrs

Surface and sub investigation for deep foundation Dip and strike, and outcrop problems(numerical problem geometrical/ simple trigonometry based), Borehole data(and problems), Faults, folds, unconformity, joints, types, recognition and their significance in Civil engineering projects like tunnel project, dam project, Reservoir site,.

MODULE-5 5 hrs

Modern Tools and geophysical methods Rocks as aquifers, water-bearing properties igneous, sedimentary and metamorphic rocks, coefficient of permeability, factors affecting permeability, Electrical Resistivity meter, depth of water table, (numerical problems), seismic studies. Remote sensing and GIS. Rainwater harvesting & its types. L1, L2, L3

PRACTICAL COMPONENT OF IPCC (May cover all / major modules)

S1.NO	Experiments
1	Identification of common minerals based on Physical Properties
2	Identification of rocks used in building construction based on Physical properties
3	Solving Geological maps for suitability for aqua duct
4	Geological maps with inclined beds, suitability for tunnels/ Dams
5	Geological maps with folds, in tunnels/ Dams
6	Geological maps with unconformity , in tunnel/dam project
7	Geological maps with faults in Dams/tunnels project
8	One Day Nearest Field Visit Investigation.

Course outcomes

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

- CO1: Apply geological knowledge in different civil engineering practice.
- CO2: Acquire knowledge on durability and competence of foundation rocks, and will be able to use the best building materials.
- CO3: Students will become competent enough for the safety, stability, economy and life of thestructures that they construct
- CO4: Able to solve various issues related to ground water exploration, build up dams, bridges,tunnels which are often confronted with ground water problems
- CO5: Students will become Intelligent enough to apply GIS, GPS and remote sensing as a latest tool in different civil engineering for safe and solid construction.

Suggested Learning Resources: Books

- 1. Engineering Geology, by Parthasarathy et al, Wiley publications
- 2. A textbook of Engineering Geology by ChennaKesavulu, Mac Millan India Ltd
- 3. Principle of Engineering Geology, by K.M. Bangar, Standard publishers
- 4. Physical and Engineering Geology, by S.K. Garg, Khanna publishers
- 5. Principles of Engineering Geology, by KVGK Gokhale, BS Publications

Reference Books

1. Introduction to Environmental Geology by Edward A Keller, Pearson publications.

- 2. Engineering Geology and Rock Mechanics B. P. Verma, Khanna publishers
- 3. Principles of Engineering Geology and Geotechnics, Krynine and Judd, CBS Publications

Web links and Video Lectures (e-Resources):

- <u>https://www.youtube.com/watch?v=aTVDiRtRook&list=PLDF5162B475DD915F</u>
- <u>https://www.youtube.com/watch?v=EBiLLJAxBuU&index=2&list=PLDF5162B475DD915F</u>
- <u>https://www.youtube.com/watch?v=sTY-ao4RZck&list=PLDF5162B475DD915F&index=3</u>
- <u>https://nptel.ac.in/courses</u>
- <u>https://youtu.be/fvoYHzAhvVM</u>
- <u>https://youtu.be/aTVDiRtRook</u>
- <u>https://serc.carleton.edu/NAGTWorkshops/hazards/events/12262004.html?serc_source=</u> <u>recommendation</u>
- <u>https://serc.carleton.edu/NAGTWorkshops/visualization/examples/CBezanson.html?sercsource=r</u> <u>ecom mendation</u>
- <u>https://serc.carleton.edu/NAGTWorkshops/coursedesign/goalsdb/14712.html</u>
- <u>https://www.earthsciweek.org/classroom-activities</u>
- NPTEL materials

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

- Field Visits
- Quiz/Assignments/Open book test to develop skills
- Encourage collaborative learning in the class
- Demonstration of Geological models and animations
- Hands on experiments with Rock and Minerals

B.E. CIVIL ENGINEERING						
Cho	Choice Based Credit System (CBCS)					
	SEMESTER – III	·				
Water Supply	and Waste Water Engine	ering (3:0:0) 3				
(Effective	from the academic year 20	23-24)				
Course Code	BCV304	CIE Marks	50			
Teaching Hours/Week (L:T:P) 3:0:0 SEE Marks 50						
Total Number of Contact Hours40Exam Hours3						
Course Objectives:						

This course will enable students to:

- Compare upon suitability and sources of water, and mode of distribution system for a 1. township.
- 2. Identify the various Physical, Chemical and Biological treatment units in treating Water and Wastewater for the desired end use.
- 3. Distinguish the latest technologies in treatment through study of advanced research as case studies
- 4. Evaluate wastewater quality and the environmental significance upon its disposal to natural systems due to its various parameters.
- 5. Perform exercises in a group to address issues relevant to water and wastewater for any neighborhood, with inferential analysis and suitable documentation of the same.

Module -1

Introduction and Relevance of the Course: Need for protected water supply.

Water demands: Types, Per capita consumption, Peak factor, Design period.Population forecasting: Different methods with Merits & Demerits (Numerical to be solved) Water quality parameters: Physical, Chemical and Microbiological - Sampling & Testing. Drinking water standards as per BIS & WHO guidelines.

Water Treatment Plant: Objectives, Unit flow diagrams and Significance of each Unit Self-Learning Component: Literature Study of water quality and its issues in various places in Karnataka, and links established between water quality and health through these studies. L1, L2, L3

Module – 2

Intake structures: Types, Factor of selection for location of intakes. Aeration: Principles, types of Aerators.

Sedimentation: Theory, Settling Tanks-Types, Numerical. Coagulation and Flocculation, Theory, Types of Coagulant, Jar Test Experiment

Filtration: Theory, Rapid Sand Filters & Pressure Filters - Operation and Maintenance, Numerical Disinfection: Types of Disinfectants with merits and demerits, Chlorination: Theory, Types Self-Learning Component: Distribution Systems - Types, Systems of Supply, Types of Service Reservoirs. L1, L2, L3

Miscellaneous Treatment

Module – 3

- Softening: Significance, Removal by Lime-soda process and Zeolite process
- De-fluoridation: Need and Nalgonda Technique.

Municipal Wastewater Treatment: Need for sanitation, Types of sewerage systems, DWF & WWF Numerical on Design of Sewers & Estimation of Storm flow. Sewer Appurtenances: Types and Function, Manholes (Types, Construction and Application)

Self-Learning Component: Sewers: Shapes (Merits, Demerits, Applicability) L1, L2, L3

	Module – 4
Treat	ment of Municipal Wastewater Plant: Unit flow diagrams and Significance of each Unit.
Prelim Tanks	ninary treatment: Equalization, Screens – Types, Grit Chambers, Oil and Grease Removal
Attack	ned Growth / Fixed film bioprocess: Trickling Filter- Theory and operation. Numerical.
Suspe	ended Growth Bioprocess: Activated Sludge Process – Principle, Flow diagram of Conventional
Sludg	reatment: Logic and Techniques (Thickening, Drying, Anaerobic Digestion, Incineration,
Comp	osting)
Self-L	<i>cearning Component</i> : Fecal Sludge Management (Teaching Pedagogy - Industrial Visits.) L1, L2, L3
	Module – 5
Low-c	cost Wastewater Treatment methods (Principle): Aerobic Pond, Anaerobic Pond, Aerated
Lagoo	n, Facultative Stabilization Ponds and Oxidation ditches.
Dispo	sal of Effluents - Effluent Disposal standards
•	Self-purification phenomenon, DO Sag Curve, Zones of Purification,
•	Disposal on Land (Sewage Farming, Effluent Irrigation) and Sewage Sickness Numerical on
Indivi	DOD. dual Household wastewater treatment methods - Sentic Tank & Soak Pit
Flippe	ed Class: OSHA aspects at Water and Wastewater Treatment Plants
Self-L	earning Component: Latest Technologies and Modern Software
Sum	mary of the Course: Internship Opportunities.
	L1, L2, L3
Cours	se Outcomes: The students will be able to:
CO1:	Appraise 'need-based' pre-requisites and components for setting up a "Protected Water Supply Scheme".
CO2:	Analyze the Principles of Public Health Engineering to develop various physical, chemical and biological environmental systems for a Water Supply Scheme
CO3.	Appraise 'need-based' pre-requisites and components for setting up a "Sanitary Engineering
	Systems".
CO4:	Analyze the Principles of Public Health Engineering to develop various physical, chemical, and biological environmental systems for a Wastewater Treatment Scheme.
CO5:	Assess wholistic applicability and feasibility of environmental systems and treatment techniques for any naturally and anthropogenically driven water pollution
CO6:	Identify latest techniques and developments in Water Supply and Sanitary Engineering.
Textb	ooks:
1.	S. K. Garg, Environmental Engineering, Vol - I & II, Water Supply Engineering, 18th Edition,
	M/s Khanna Publishers, New Delhi, 2007.
2.	B. C. Punmia and Ashok Jain, Environmental Engineering I &II - Water Supply Engineering,
3.	Howard S. Peavy, Donald R. Rowe, George T., Environmental Engineering, McGraw Hill,
	International Edition, New York, 2000.
4.	Metcalf & Eddy, Waste Water Engineering: Treatment & Reuse, 4 th Edition, McGraw Hill Education, 2003.
Refer	ences:
1.	Hammer. M.J., Water and Waste Water Technology, 7th Edition, Pearson, 2011.
2.	CPHEEO, Manual on Water Supply and Treatment", Ministry of Urban Development, New Delhi, 1999.
3.	APHA, Standard Methods for the Examination of Water and Wastewater, 21 st Edn. American Public Health Association, Washington DC, 2005.

B.E. CIVIL ENGINEERING Choice Based Credit System (CBCS) SEMESTER - III					
	Computer Ai	ded Building Planning and Drawing (0:0:2 fective from the academic year 2023-24)	2) 1		
Course	e Code	BCV305	CIE Marks	50	
Teachi	ng Hours/Week (L:T:P: S)	0:0:2	SEE Marks	50	
Total N	fumber of Contact Hours	15	Exam Hours	3 Hours	
Course 1. Ga 2. Un 3. Vi	e objectives: ain skill set to prepare Compute nderstanding the details of cons sualize the completed form of the gingering drawings	er Aided Engineering Drawings using a soft struction of different building elements he building and the intricacies of constructi	ware ion based on th	e	
4 Ge	et familiarization of practices us	sed in Industry			
S1.NO	the function of practices at	Experiments			
		(L1, L2, L3, L4, L5)			
1	Drawing Basics: Selection of s	scales for various drawings, thickness of lin	es, dimensionir	ng,	
T	abbreviations and conventiona	al representations as per IS:962.			
2	Drawing Tools: Lines Circle,	Arc, Poly line, Multiline, Polygon, Rectangl	le, Spline, Ellip	se,	
2	Modify tools: Erase, Copy, M	irror, Offset, Array, Move, Rotate, Scale,	Stretch, Length	ien,Trim,	
	Extend, Break, Chamfer and H	Fillet,			
3	Using Text: Single line text, M	Iultiline text, Spelling, Edit text			
4	Special Features: View tools	s, Layers concept, Dimension tools, Hato	ching, Customi	zing	
5	 5 Drawings of Different Building Elements: Refer NBC before practice a) Footing/ Foundation – Foundation dimension for Isolated, combined footing, Standarddimension and cross section of footing b) Size stone Masonry – Size of single and double bond stone, Sections at wall foundation c> Brick Masonry – Size of standard Burnt Brick, Solid Cement Block, Hollow Cement block. Other bricks used in current practice 				
	Principles of planning, Plann	ing regulations and building bye-laws, fa	actors affecting	site	
6	selection, Functional planning of residential and public buildings, design aspects for different				
	public buildings. Recommendations of NBC.				
7	Draw a building plan for sin dimension. Students have to g	ngle and double bed room accommodations of through Building Bye Laws and regulations and regulations and regulations and regulations and regulations and regulations are as a set of the se	on for a given ns	site	
8	Prepare the centre line drawing for marking the single and double bedroom house as in in exercise 6				
9	Prepare a complete sanction p requirements to plan Resident	lan for the exercise 6 as per the bye law. Al ial Building, School building, Hospital Build	so study the ding, Offices		
10	10 Drawing of plan with electrical, plumbing and sanitary services using CAD software.				
11	Drawing standard cross-section	ons for Lintel and chajja, RCC Slabs, Colum	ns and beams		
12	Drawing different types of stai	rcases – Dog legged, Open well – plan and c	cross-sections.		

Course outcomes

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

CO1: Prepare, read and interpret the drawings in a professional set up.

CO2: Know the procedures of submission of drawings and Develop working and submission drawings

for building.

CO3: Plan of residential or public building as per the given requirements.

Suggested Learning Resources:

- MG Shah, CM Kale, SY Patki, "Building drawing with an integrated approach to Built Environment Drawing", Tata McGraw Hill Publishing co. Ltd, New Delhi.
- Gurucharan Singh, "Building Construction", Standard Publishers, & distributors, New Delhi.
- Malik RS and a Meo GS, "Civil Engineering Drawing", Asian Publishers/ComputechPublication Pvt Ltd

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - III

Rural, Urban Planning and Architecture (3:0:0) 3

(Effective from the academic year 2023-24)				
Course Code	BCV306A	CIE Marks	50	
Teaching Hours/Week (L: T:P: S)	3:0:0	SEE Marks	50	
Total Number of Contact Hours	40	Exam Hours	03	

Course objectives:

- 1. To make the student understand about the past and present architecture of different parts of the world
- 2. Rural and urban planning and growth and circulation of patterns and effect of increase in urbanization
- 3. The basic planning required for urban and rural centres with respect to physical and social aspects
- 4. Student s to visit the different place of architecture monuments to understand the concept
- 5. To understand different types of architecture and planning **Module-1**

Introduction: Aim and importance of Architecture, Architecture as a fine art. Role of an architect and an engineer. Essential principles and qualities of architecture with examples

Factors of architecture: Mass, Form, Colour, Solids, and Voids, Uniformity, Balance and Symmetry, Painting with examples. L1, L2, L3

Module-2

Architectural influence of the following: Association, Tradition, Climate, Materials, Topography, Religion social customs and aspiration of time.

Architectural characteristics of the following architecture with examples. 1. Egyptian, 2. Greek, 3. Roman, 4. Buddhist, 5. Hindu, 6. Jain, 7. Chalukyan, 8. Modern architecture

Factors that have influence present day Modern Architecture, Aesthetic difference between the past and present Architecture.

Students are advised for a technical tour related Architecture and town planning to gain additional knowledge in this subject L1, L2, L3

Module-3

Human settlements, Rural and urban pattern of growth, Factors that promote growth and development of Rural and urban areas Ancient Town Planning in India: Principles of town planning and circulation pattern with examples. L1, L2, L3

Module-4

Industrialization: Impact on town planning, Urbanisation causes, its effect on town and cities, remedial measures both in urban and rural planning

Circulation pattern in cities: Urban roads and streets, their fuctional classification, traffic survey data and its use in town planning. **L1, L2, L3**

Module-5

Contemporary objectives and methods of planning of town: Development plans for cities, objectives and stages involved in their preparation and implementation, space standards for planning. **L1, L2, L3**

Course outcome

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

- CO1: Understand importance of architecture in rural and urban planning
- CO2: Understand Influence of architecture
- CO3: Design infrastructure for rural and urban region
- CO4: Plan and design rural and urban roads

Suggested Learning Resources:

Books

- 1. History of Architecture Fletcher
- 2. Urban pattern Galliaon
- 3. Indian architecture Vol. I & II Perey Brown
- 4. Principle of town and country planning Lewis Keeble
- 5. Urbanization and Urban Systems in India, Ramachandran R, Oxford University Press, New Delhi.
- 6. Town planning Rangwala, Charothar Publication

Web links and Video Lectures (e-Resources):

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

	B.E. CIVIL ENGINEERING			
	Choice Based Credit System (CBCS)			
Geo	SEMESTER - III ospatial Techniques in Practice (3:0:0)	3		
	(Effective from the academic year 2023-24)	0		
Course Code	BCV306B	CIE Marks	50	
Teaching Hours/Week (L: T:P: S)	3:0:0	SEE Marks	50	
Total Number of Contact Hours	40	Exam Hours	03Hrs	
Course objectives: 1. Introduce the concept of var	ious geospatial technologies used in the	e industry		
2. Help to acquire basic idea a	pout the processing and mapping with n	nodern surveyingequip	ment.	
3. Elaborate proven concepts,	business practices and applications of g	eospatial technology.		
4. Explain learners understan	d how geospatial concepts are leveraged	d in handling real worl	dbusiness	
challenges of engineering ar	id construction industry.	C		
	Module-1			
Need of Geospatial technology	in Industry: Spatial thinking, Evolution	ution of location tech	nology and	
importance of geography and ma	ps. Need for spatial information, Term	inologies, logic, data a	acquisitions,	
language and formats of spatial	technology. Overview of Geospatial te	chnology in tenders,	Design and	
execution & Construction lifecy	ele management, urban planning. Fu	undamentals and con	nponents of	
Geospatial Engineering, Surveyin	g and Conventional survey equipment	Vs Modern surveying	g equipment	
Components. Digital Land Surveyi	ng Needs.	I	L1, L2, L3	
	Module-2			
Total Station and Global Navig Survey and Mapping, Geospatial S mapping, Advanced geospatial sol Global navigation System.	ation Satellite System (GNSS): Basic urveying Equipment, Demo of Total Sta utions, GNSS Overview ofcomponents,	tion Equipment, Settin working and signal str L1	luction to ag out and ructure of L, L2, L3	
	Module-3			
Geospatial Engineering and technology: Remote Sensing Technologies, Types of remote sensing, Sensors and its types, Application of sensors & platforms, Image Acquisition, Applications of Remote Sensing. 3D scanning, Principles and the science behind photogrammetry, LiDAR, RADAR, SONAR & Drones. Introduction to Platforms and working.L1, L2, L3				
Module-4				
Geographical Information System Map. Hardware for GIS, DEM and conversions from non-spatial form Conversion of CAD TO GIS, Demo of referencing Topo sheets and Raster	Module-4 Geographical Information System: Basics of GIS, Vector & Raster data models, Types and components of a Map. Hardware for GIS, DEM and TIN Data products, Attribute Data Types. Basic GIS data conversions, conversions from non-spatial formats to spatial formats. Demo of Conversion of Excel to GIS, Demo of Conversion of CAD TO GIS, Demo of conversion of drone/satellite data to GIS, Demo of Downloading and Georeferencing Topo sheets and Raster files			

Module-5

Applications and Future trends of Geospatial Technologies:Application of GIS - Spatial Analysis,
Catchment Area delineation, Overlay Analysis, Cluster Analysis, Hotspot Analysisand View shed Analysis.Future Trends of Geospatial Technologies. Case Study 1 -Benefit Realization - Case Study 2 Advancements
in Modern Survey & Mapping Technologies, Advancements in Spatial Analytics - Geo Intelligence, Future
Trends, Geospatial Technology - Way Forward.L1, L2, L3

Course outcome							
At the end of the course, the student will be able to :							
CO:1 Comprehend different geospatial techniques in the Construction Industry.							
CO:2 Understand the application of geospatial equipment like Total Station, GNSS_LIDAR UAV							
(Drones), etc.,							
CO:3 Evaluate the various spatial analysis operations by using GIS Environment							
CO:4 Create a map layout with all essential cartographic elements in GIS Environment.							
CO:5 Illustrate the various geospatial emerging trends of GIS in Industry.							
Suggested Learning Resources: Books							
• T. P. Kanetkar and S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune VidyarthiGriha							
Prakashan, Pune, 2010, 24th edition.							
 James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, SeventhEdition, McGraw Hill 2001 							
 Satheesh Gopi, R. Sathikumar, N. Madhu, – Advanced Surveying, Total Station GPSand Remote Sensing – Pearson education, 2nd Edition, 2017. 							
 George Joseph and C. Jeganathan, Fundamentals of Remote Sensing, Third EditionUniversities Press (India) Private limited, Hyderabad, 2018 							
• M. Anij Reddy. Textbook of Remote Sensing and Geographical Information systems. BSPublications,							
2012.							
Web links and Video Lectures (e-Resources):							
E-learning content on L&T EduTech Platform.							
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning							
ArcGIS Online Open source							
QGIS Open source							
GPS co-ordinates app Open source							
Total Station Demo							
GNSS Demo							

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - III

Sustainable Design Concept for Building Services (3:0:0) 3

	(Effective from the academic year 2023-24)		
Course Code	BCV306C	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hrs

Course objectives:

- 1. To facilitate learners to understand sustainable building designs and its parameters such as energy and water efficiency, Comfort in buildings, and waste management.
- 2. To expose the learners to shading systems, thermal and visual comfort.
- 3. To impart fundamental knowledge on Life cycle assessment and Green ratings and certifications.

Module-1

Introduction to Sustainability and Climatology: Overview of Sustainability – Global energyscenario, carbon footprint and climate action, Net zero in carbon offsetting, Water neutral, Sustainable construction and resource management. Green buildings - Selection of site –preservation and planning, Influence of climate on buildings, Basics of climatology, Earth – Sun relationship, Solar angles and sun path diagram. L1, L2, L3

Module-2

Comfort in Buildings: Thermal comfort – Basics of Thermodynamics, Convection/radiation heat transfer, Heat gain through various elements of a building, Thermal comfort models and case studies Acoustics – Building acoustics, measures, defects and prevention of sound transmission Indoor Air Quality – Effects, design consideration and integrated approach for IAQ management Visual comfort – Enhancement strategies for Daylighting and Artificial. **L1, L2, L3**

Module-3

Energy, water efficiency and waste management in buildings: Energy efficiency – Energy efficiency in building envelope and energy efficient HVAC and Lighting as per Energy conservation building code (ECBC) 2017. Water Efficiency – Planning and design of water management system, Rain water harvesting, Water efficient design and fixtures, Treatment andreuse and Water efficient landscape system.

Waste management – Types of waste and its treatment methods, Construction and demolition waste management, Waste management in residential, commercial buildings, healthcare facilities. **L1, L2, L3**

Module-4

Life Cycle Assessment of Buildings and Green project management: Materials – Green product certifications, features of sustainable building materials and sustainable alternatives for structural, envelope and finishing materials. Low carbon cement, Zero emission bricks and lean construction practices. Life cycle assessment and its types. Greenhouse gas emission. Different phases of Green building project management. L1, L2, L3

Module-5

Sustainable rating systems: Green building rating systems- LEED, BREEAM and others, Indian Green building rating systems – IGBC & GRIHA. IGBC criteria for certification -site selection credits, pre-design credits, detailed design credits, pre-construction credits, construction credits, post construction credits. L1, L2, L3

Course outcome

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

CO:1 Comprehend sustainable design, climatology, shading system and analyze heat transfermechanism in buildings.

CO:2 Assess the design considerations and parameters for thermal comfort, visual comfort, indoorair quality and acoustics.

CO:3 Develop solutions for energy efficiency, water efficiency and waste management inbuildings.

CO:4 Adopt green project management methodology and evaluate building life cycle assessment.

CO:5 Implement green practices during construction and operation phase of the buildings forachieving green rating.

Suggested Learning Resources:

Books

- 1. HarharaIyer G, Green Building Fundamentals, Notion Press
- 2. Dr. Adv. HarshulSavla, Green Building: Principles & Practices
- 3. IGBC Green new building rating system version 3.0 Abridged reference guide
- 4. The Sustainable Habitat Handbook (6 Volume Set), GRIHA Version 2019
- 5. National Building Code 2016, Volume 1&2, Bureau of Indian Standards

Energy Conservation Building Code - 2017 (with amendments up to 2020), Bureau of Energy Efficiency

Web links and Video Lectures (e-Resources):

E-learning content on L&T EduTech Platform.

Suggested Learning Resources:

Books

- 1. HarharaIyer G, Green Building Fundamentals, Notion Press
- 2. Dr. Adv. HarshulSavla, Green Building: Principles & Practices
- 3. IGBC Green new building rating system version 3.0 Abridged reference guide
- 4. The Sustainable Habitat Handbook (6 Volume Set), GRIHA Version 2019

5. National Building Code - 2016, Volume 1&2, Bureau of Indian Standards

Energy Conservation Building Code – 2017 (with amendments up to 2020), Bureau ofEnergy Efficiency Web links and Video Lectures (e-Resources):

E-learning content on L&T EduTech Platform.

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

- ECO NIWAS by Ministry of Power, Free Web tool to practice energy conservation
- Roof top solar energy calculator, Free Web tool to calculate solar power available

	B.E. CIVIL ENGINEERING		
	Choice Based Credit System (CBCS)		
	SEMESTER - III		
	Fire Safety in Buildings (3:0:0) 3		
	(Effective from the academic year 2023-24)		
Course Code	BCV306D	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

Course objectives:

- 1. To understand the importance fire safety
- 2. To learn various techniques involved in fire safety
- 3. To design fire resistant buildings using proper materials and methods

Module-1

Fire: Introduction, Basic concepts of fire protection, Fire as a process of combustion, planning for fire protection, fire resistance Ventilation and fuel controlled fire, process of combustion: flashover condition, effect of fire on construction material, design of fire resistance steel structure, concrete structure.

L1, L2, L3

Module-2

Fire safety: urban planning, escape and refuge, internal planning, detection and suppression Introduction to lift design, design of lift system, expected stop and floor of reversal, different cases, simulation, arrangements and escalators, fire safety design guidelines and codes. **L1, L2, L3**

Module-3

Introduction to flow system: water supply, constant demand, variable demand and diversity factor, control systems Flow in pipe networks and fixture units, design of water supply distribution system, flow in wastewater pipes. L1, L2, L3

Module-4

Introduction to HVAC: governing equations to HVAC process, numerical problem on HVAC system, psychometric chart, equation based approach Electrical systems: design of electrical systems, intelligent building, life cycle cost and basics of building maintenance, stages of maintenance management, planning for building maintenance, periodicity of maintenance management, estimation of repair cycle, cost profile of maintenance, building inspection, planned and Ad-hoc maintenance. **L1, L2, L3**

Module-5

Condition survey and health evaluation of buildings, diagnosis of building by visual survey, casestudies of visual survey, effect of corrosion and alkali aggregate reaction, sampling and choice oftest location Nondestructive testing, core strength test, carbonation and chloride measurement, electrical method of progress measurement Repair, rehabilitation, retrofit, periodicity and economics of condition survey, interpretation of test results.

Course outcome

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

- CO:1 Understand types of fire, combustion process and fire resistance
- CO:2 Plan for fire safety and design of lifts
- CO:3 Design flow network in buildings
- CO:4 Design of electrical systems and maintenance
- CO:5 Perform health evaluation of buildings and suggest remedies

Suggested Learning Resources:

Books

- 1. J A Purkiss, Fire Safety Engineering: Design of Structures, ISBN 13 978-8131220085, Elsevier, 2009
- 2. V K Jain, Fire Safety in Buildings, ISBN-13 978-938980219, New Age International Private Limited; Third edition, 2020
- 3. Fire protection, services and maintenance management of building, NPTEL video lecture, IIT, Delhi
- 4. Bureau of Indian Standards, "HAND BOOK OF FUNCTIONAL REQUIREMENTS OFBUILDINGS, (SP-41 & SP- 32)", BIS 1987 and 1989.
- 5. Markus, T.A. & Morris, E.N., "BUILDING CLIMATE AND ENERGY" Pitman publishing limited. 1980.
- 6. Croome, J.D. & Roberts, B.M., "AIR CONDITIONING AND VENTILATION OF BUILDINGS, VOL-1". Pergamon press.
- 7. Building Services Design T.W.MEVER
- 8. Building Engineering & System Design F.S.MERRIT & J. AMBROSE
- 9. SP-35 (1987): Handbook of Water supply & drainage-BIS10.

10. N.B.C.-2007 BIS

- 11. Concept of building fire safety D.EGAN.
- 12. Design of fire resisting structures H.L. MALHOTRA.

List of reference materials/books/

- 1. An introduction to fire dynamics -D.DRYSDALE
- 2. Structural fire protection Edt by T.T.LIE
- 3. Elevator technology G.C.BARNEY
- 4. HEATING VENTILATING AND AIR CONDITIONING Analysis and Design Faye C. McQuiston and Jerald D.Parker.
- 5. Building Maintenance Management-R.LEE
- 6. Developments In Building Maintenance -I.EJ. GIBSON
- 7. Concrete Structures: materials, Maintenance And Repai D.CAMPBELL, ALLEN
- & H.ROPER

Web links and Video Lectures (e-Resources):

• https://archive.nptel.ac.in/courses/105/102/105102176/

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

• Assignment students: A case study of fire hazard in building and restoration procedure adopted

Cho	B.E. CIVIL ENGINEERING ice Based Credit System (CBCS SEMESTER – III)			
Social Connect and Responsibility (0:0:2)1 (Common to all branches) (Effective from the academic year 2023-24)					
Course Code	BSCK307	CIE Marks	100		
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	-		
Total Number of Contact Hours	26 Hours	Exam Hours	-		
Credits	01	·			

Course objectives: The course will enable the students to:

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

Social Connect & Responsibility -All Modules Activity Based Learning

Module-1

Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - Objectives, Visit, case study, report, outcomes. **(04 Hours) L1,L2,L3**

Module-2

Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms – Objectives, Visit, case study, report, outcomes.

(05 Hours) L1,L2,L3

Module-3

Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus – Objectives, Visit, case study, report, outcomes. (06 Hours) L1,L2,L3

Module-4

Water conservation: Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes. **(06 Hours) L1,L2,L3**

Module-5

Food walk: City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study, report, outcomes. **(05 Hours) L1,L2,L3**

Course outcomes

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

CO1: Communicate and connect to the surrounding.

CO2: Create a responsible connection with society.

CO3: Involve in the community in general in which they work.

CO4: Notice the needs and problems of the community and involve them in problem -solving.

CO5: Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.

CO6: Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

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

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

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

Duration: A total of 26 hours engagement per semester is required for the 3rd semester of the B.E./B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic, and poetry) Faculty mentors have to design the evaluation system as per VTU guidelines of scheme & syllabus.

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

Excellent: 80 to 100 Good: 60 to 79 Satisfactory: 40 to 59 Unsatisfactory and fail: <39

Special Note: **NO Semester End Examination (SEE) – Completely Practical and activities-based** evaluation

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

S1 N o	Торіс	Group size	Location	Activity execution	Reporting	Evaluatio n of the Topic
1.	Plantation and	May be individua	Farmers land/ parks / Villages / roadside/	Site selection /Proper	Report should be	Evaluatio n as per the
	a tree	1 Of team	College campus etc	Continuous monitoring/ Information	by individual to the	rubrics of scheme and

				board	concerned evaluatio n authority	syllabus by Faculty
2.	Heritage walk and crafts corner	May be individua l or team	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations/Governmen t Schemes officers/ campus etc	Site selection /Proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluatio n as per the rubrics of scheme and syllabus by Faculty
3.	Organic farming and waste management	May be individua l or team	Farmers land / parks / Villages visits / roadside/ community area / College campus etc	Group selection / proper consultation / Continuou s monitoring / Informatio n board	Report should be submitted by individual to the concerned evaluation authority	Evaluatio n as per the rubrics of scheme and syllabus by Faculty
4.	Water conservation & conservatio n techniques	May be individua l or team	Villages/ City Areas / Grama panchayat/ public associations/Governmen t Schemes officers / campus etc	site selection / proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluatio n as per the rubrics of scheme and syllabus by Faculty
5.	Food walk: Practices in society	May be individua 1 or team	Villages/ City Areas / Grama panchayat/ public associations/Governmen t Schemes officers/ campus etc	Group selection / proper consultation / Continuou s monitoring / Informatio n board	Report should be submitted by individual to the concerned evaluation authority	Evaluatio n as per the rubrics of scheme and syllabus by Faculty
•						

Plan of Action (Execution of Activities)

S1.NO	Practice Session Description
1	Lecture session in field to start activities
2	Students Presentation on Ideas
3	Commencement of activity and its progress
4	Execution of Activity
5	Execution of Activity
6	Execution of Activity
7	Execution of Activity
8	Case study-based Assessment, Individual performance
9	Sector/ Team wise study and its consolidation
10	Video based seminar for 10 minutes by each student At the end of semester with Report.

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

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

	Ch	B.E. CIVIL ENGINEERING oice Based Credit System (CBCS)				
	SEMESTER - III Data analytics with Excel (0:0:2) 1					
	(Effect	tive from the academic year 2023-24)				
Course	Code	BCV358A	CIE Marks	50		
Teachir	ng Hours/Week (L:T:P: S)	0:0:2	SEE Marks	50		
Total Nu	mber of Contact Hours	30	Exam Hours	2		
Course	objectives:					
1. U 2 F	inderstand the use of spreadshe	ets for data collection and analysis.				
2. L 3. L	earn the data quality and consis	stency of data				
01 NO	1 5					
51.NO		Lxperiments (L1, L2, L3, L4, L5)				
1	Introduction to Data Analysis	Using Spreadsheets: Fundamentals of	spreadsheet applicati	one Evcel		
	Introduction to Data Analysis	Using Spreadsheets. Fundamentals of	spreausneet applicati	ons, Excer		
0	interface, and learn how to nav	rigate around a worksheet and workboo	ok.			
2	Using Excel Spreadsheets: Op	ening, saving, and organizing data in	Excel. Basic formattir	ig: Fonts.		
	alignment cell styles and hord	lers Entering and editing data in cells	,	0 /		
3	Cleaning & Wrangling Date Us	ing Spreadshoots, Importance of data	erralitar la arra ta iman am	t file data		
	Cleaning & wranging Data Us	ing spreadsneets. Importance of data		t me data		
	into Excel, fundamentals of da	ta privacy, remove duplicate and inacc	urate data, remove en	npty rows		
	in your data.					
4	Introduction to Data Transform	nation: Introduction to Flash Fill: Basic	es and Applications.			
	Introduction to Text to Column patterns, combining data).Basi	s: Basics and applications. Basic Flas c Flash Fill operations (e.g., extracting	h Fill operations (e.g., patterns, combining o	extracting lata).		
5	Analyzing Data Using Spreadsheets: Data validation and conditional formatting. Introduction to pivot					
	tables and pivot charts. Introdu	action to data analysis tools (e.g., Goal	Seek, Solver).			
6	 Data Visualization and Reporting: Creating different types of charts (e.g., bar charts, line charts, pie charts). Customizing and formatting charts for effective representation. Combining charts and creating dashboards for reporting 					
7	Final Project: Final project: D	esign a data analysis and visualizati	on report using Exce	el, graded		
	assignment for cleaning and preparing data, and then analyzing data using an Excel spreadsheet.					
8 Submission of report for final assessment						
Course	outcomes					
At the e	end of the course the student wi	ll be able to:				
CO1: F	CO1: Prepare the data sets and perform the analysis.					
CO2: P	CO2: Analyse and perform repetitive calculations using several functions.					
CO3: 1	cos. Design and apply solutions to verify the data sets.					
Suggested Learning Resources:						
•	https://www.coursera.org/lear	n/excel-basics-data-analysis-ibm				
	A new anding a matching with the all		and NDTEL commence			

- Any online platform with the above course content like YouTube videos and NPTEL courses

B.E. CIVIL ENGINEERING				
Cl	noice Based Credit System (CBCS)			
	SEMESTER - III			
Sm	Smart Urban Infrastructure (1:0:0) 1			
(E	ffective from the academic year 2023-24)			
Course Code BCV358B CIE Marks 50				
Teaching Hours/Week (L: T:P: S)1:0:0SEE Marks50				
Total Number of Contact Hours 15 Exam Hours 1				

Course objectives:

- 1. Knowing about Urban Infrastructure Systems & their Management
- 2. Knowing about Smart Cities Key Concepts
- 3. Understand the Transport and Energy Smart Urban Infrastructure and Services
- 4. Developing Feasibility Studies for Smart City Services
- 5. Understand the Global Context of Smart Cities

Module-1

Introduction to Smart Urban Infrastructures and Smart Cities: Introduction to smart city, Basic concept of developing smart city, Global standards to create smart city. Different conceptual approaches to Smart Cities and discussing the pros and cons of each approach. Smart urban Infrastructure: List of infrastructure facilities, advantages and disadvantages. L1, L2, L3

Module-2

Smart Urban Energy Systems: Introduction to Smart Energy Systems, Government policy and technology.Energy sector to explore some of the most important managerial considerations in the transition phase and
operation of Smart Urban Energy Systems.L1, L2, L3

Module-3

Smart Transportation Technologies: Introduction to smart transportation system, Mode of transport systems for smart city, data collection to arrive at best transport facility. Significant opportunities and threads for legacy urban transportation systems. Managerial considerations to facilitate the transition phase, and operation of Smart Urban Transportation Systems. L1, L2, L3

Module-4

Towards Smart Cities: Important factors in the transition phase of legacy cities to Smart cities and their managerial implications. L1, L2, L3

Module-5

Towards Smart Cities: Management of Smart Cities calls for different approaches from conventional urban management approaches. The role of city government in the network of actors who play an important role in management of Smart Cities. L1, L2, L3

Course outcome

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

CO:1 Understand the concept of smart city

CO:2 Play the role of a civil engineer in providing smart infrastructure

CO:3 Design efficient energy system for smart city

CO:4 Analyse and design efficient transport system

Suggested Learning Resources:

Books

- 1. Infrastructure for Smart Cities, Dr. R P Rathaliya, Shree Hari Publications, 2021
- 2. Building Smart Cities, ISBN-13 978-1032340128, by Carol L. Stimmel, 2022
- 3. Smart Cities for Sustainable Development, Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep Chachra, P.S. Janaki Krishna, Springer, ISBN-13 978-9811674099, 2022

Web links and Video Lectures (e-Resources):

• <u>https://www.coursera.org/learn/smart-cities</u>

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

B.E. CIVIL ENGINEERING					
Ch	noice Based Credit System (CBCS)				
	SEMESTER - III				
Prot	Problem Solving with Python (1:0:0) 1				
(Ef	(Effective from the academic year 2023-24)				
Course Code BCV358C CIE Marks 50					
Teaching Hours/Week (L: T:P: S)1:0:0SEE Marks50					
Total Number of Contact Hours	15	Exam Hours	1		

Course objectives:

- 1. To understand why Python is a useful scripting language for developers.
- 2. To read and write simple Python programs
- 3. To learn how to identify Python object types.
- 4. To learn how to write functions and pass arguments in Python.

Module-1

Introduction to Python: Installing Python and Python packages, Managing virtual environments

with venv module Introduction to NumPy arrays:Array creation, indexing, data types,broadcasting, copies and views, universal functions, I/O with NumPy. **L1, L2, L3, L4**

Module-2

Introduction to NumPy and SciPy: NumPy subpackages– linalg, fft, random, polynomials, SciPy subpackages– linalg, fftpack, integrate, interpolate, optimize Introduction to Matplotlib: Plotting 2D graphs with Matplotlib, annotations, legend, saving plots to file, bar and pie charts, line plots. **L1, L2, L3, L4**

Module-3

Linear algebra using NumPy and SciPy: Solving linear simultaneous equations using NumPy and SciPy using numpy.linalg and scipy.linalg – solve, inverse, determinant, least squaresolution, Linear algebra using NumPy and SciPy (continued): Decomposition using lu and cholesky. Solving eigenvalue problems using NumPy and SciPy:Using numpy.linalg and scipy.linalg – eig, eigvals.

L1, L2, L3, L4, L5

Module-4

Solving initial value problems for ODE systems using scipy.integrate subpackage – solve_ivp, RK45, LSODA. Numerical integration of functions using SciPy:Using scipy.integratesubpackage– Definite integral using Gaussian quadrature – quad and quadrature Numerical integration of fixed samples using scipy.integrate subpackage– Trapezoidal rule trapezoid, Simpson's 1/3 rule using Simpson, Romberg integration romb.

L1, L2, L3, L4, L5

Module-5

Determining roots of equations using Sci Pyusing scipy.optimize sub package– Bisection method bisect, Brent's method brentq, Newton-Raphson method newton. Symbolic computing using SymPy and solving civil engineering problems using SymPy: Introduction, defining symbols, derivatives, integrals, limits, expression evaluation, expression simplification, solving equations, solving differential equations

L1, L2, L3, L4, L5

Course outcome

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

- CO1 Understand Python syntax and semantics and be fluent in the use of Python flow control andfunctions.
- CO2 Demonstrate proficiency in handling Strings and File Systems.
- CO3 Represent compound data using Python lists, tuples, Strings, dictionaries.
- CO4 Read and write data from/to files in Python Programs

Suggested Learning Resources:

Books

- 1. R. Nageswara Rao, "Core Python Programming", dreamtech
- 2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
- 3. Python Programming , Reema theraja, OXFORD publication

Web links and Video Lectures (e-Resources):

- NumPy documentation at https://numpy.org/doc/
- SciPy documentation at https://docs.scipy.org/doc/scipy/
- Matplotlib documentation at <u>https://matplotlib.org/stable/users/index</u>

SymPy documentation at https://docs.sympy.org/latest/index.html.

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

• Real world problem solving: Demonstration of projects developed using python language

B.E. CIVIL ENGINEERING				
Ch	noice Based Credit System (CBCS)			
	SEMESTER - III			
Personality Development for Civil Engineers (1:0:0) 1				
(Ef	fective from the academic year 2023-24)			
Course Code BCV358D CIE Marks 50				
Teaching Hours/Week (L: T:P: S)1:0:0SEE Marks50				
otal Number of Contact Hours 15 Exam Hours 1				

Course objectives:

- 1. To offer placement focused guidance across interview best practices, formal communication, and business etiquette
- 2. To give learners a comprehensive understanding of job skills and knowledge that are essential for adapting to changes in workplace

Module-1				
LSRW and Personality Development: Importance of LSRW Skills: Art of listening	ng- Listening			
comprehension - Art of Speaking - Art of Reading - Reading comprehension - Art of Writing -	- email writing			
Personality Development: Emotional Intelligence – Self Awareness				
– Self Management – Personal SWOT – Manners & Etiquette – Positive Attitude – Confidence building				
Interpersonal Skills: Active Listening – Motivation – Flexibility – Patience – Dependability –				
Adaptability – Interpersonal & Intrapersonal skills – Body Language	L1, L2, L3			

Module-2

NVC, Presentation and Teamwork: Non – Verbal Communication: Body language – Gestures – Postures – Eye contact – Hand Shake – First impression – Proxemics – Facial Expressions Presentation Skills: 4P's of Presentation – Communicating with Credibility – Audience analysis and Building Rapport – Usage of Figures, diagrams & Charts – Presenting with Confidence – Body Language in Presentation Teamwork: What is a Team - Stages of a Team – Benefits of Team work & Collaboration – Group vs Team – Types of Teams – Roles of the Team

Module-3

Etiquette and Management: Critical Thinking & Problem Solving: Core Skills – Uses & Importance of Critical Thinking – Principles of Critical Thinking – Facts about ProblemSolving – Skills to use in Problem Solving - Problem Solving Process – Barriers to Problem Solving Time Management: Managing your time – Time wasters – Analyzing your Strengths and weakness – Goal Setting – Why Goal Setting is important - SMART Goals – Types of Goals Business Etiquette: Types of Etiquette – Importance of Etiquette – Meeting Etiquette – Phone and email Etiquette – Work Place Etiquette **L1, L2, L3**

Module-4

Leadership: Leadership Skills: What makes an effective Leader – Relationship Building –Leader vs Boss – Decision Making Skills – Innovation & Motivation – Dependability Business Writing – How to improve your Business writing skills – Importance of Business writing – howto write effectively – 5C's of Business writing – 4 types of Business writing Conflict Management: Strategies of Conflict Management – Best practices for Conflict Resolution – Stress Management – Learn to say No – Importance of Conflict Management at Work Place L1, L2, L3

Module-5

V GD, Creativity and Psychometry: Group Discussion: Types of GD – Attitude & being Proactive – Time management & how to stick to it – Importance of Listening - Do's & Don'ts Creativity & Innovation: What is Creativity – What is Innovation – Difference between Creativity & Innovation – Categories and misconception of Creativity Psychometric Analysis: What is Psychometric Analysis – Cognitive Skills – Importance of Personality Tests – Personality Profiling- PESTEL Analysis for understanding problems and marketing Solutions L1, L2, L3

Course outcome

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

CO1 Use English as a medium of communication in interviews and in any professional working environment proficiently

CO2 Develop necessary skills to Answer common interview questions, express confidence inbody language and present with clarity

Suggested Learning Resources:

Books

- Personality Development And Soft Skills, Barun K Mitra, 2nd edition, Oxford University Press, 2016
- 2. Power of Positive thinking, Norman Vincent Peale, ISBN-13 978-0091906382, RHUK, 2016

Magic of thinking Big, David J Schwartz, ISBN-13 978-1785040474, Vermilion, 2016

Web links and Video Lectures (e-Resources):

NPTEL videos.

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

- Select a topic and write an essay
- Conduct group discussion

Cho	B.E. CIVIL ENGINEERING ice Based Credit System (CBCS	8)		
	$\frac{\text{SEMESTER} - \Pi}{\text{NSS}(0.0.2)}$			
(C	Common to all branches)			
(Effective f	From the academic year $2023-2$	4)		
Course Code	BNSK359	CIE Marks	100	
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	_	
Total Number of Contact Hours	26	Exam Hours	_	
N N N N N N N N N N N N N N N N N N N	Jandatory Course (Non-Credit)			
(Completion of the c	ourse shall be mandatory for th	a award of degree)		
Course Objectives: National Service S	Scheme (NSS) will enable the	students to:		
1. Understand the community in get	neral in which they work.	Stadonts to.		
2. Identify the needs and problems of	of the community and involve the	hem in problem solving.		
3. Develop among themselves a sense	se of social & civic responsibili	ty & utilize their knowle	edge in finding	
practical solutions to individual a	nd community problems.	-	0	
4. Develop competence required for g	group-living and sharing of resp	ponsibilities & gain skill	s in mobilizing	
community participation to acqui	re leadership qualities and dem	nocratic attitudes.		
5. Develop capacity to meet emerger	icies and natural disasters & p	ractice national integrat	tion and social	
harmony in general.	Madula 1			
Tertes 1. stills a to NOO	Module – 1			
History and growth of NSS, Philosophy of activities, administrative structure of NSS / activities, National & State Awards for	of NSS, Objectives of NSS, Mea S, Planning of programs / activi NSS College / Program Officer	ning of NSS Logo, NSS ties, implementation of / Volunteers. (04 Ho	Programs and NSS programs	
	Module – 2	(01 110	<i>uis, 21,22,20</i>	
Overview of NSS Programs Objectives, special camping – Environ Nutrition program. Awareness for impro- oriented programs, Relief & Rehabilita Selection of the problem to be addressed	ment enrichment and conservement of the status of women tion work during natural ca	vation, Health, Family , Social Service program lamities, education an	, Welfare and n, production- d recreations,	
	Madala 0	(04 Ho	ours) L1,L2,L3	
	Module – 3			
NSS Activities - Group Contributions t	o Society / community (Activ	vity 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	<u> </u>		
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. (06 Hours) L1,L2,L3				
NSS Individual Activities for Local Voi	ce (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.				

⁽⁰⁶ Hours) L1,L2,L3

Course outcomes :

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

CO1: Understand the importance of his / her responsibilities towards society.

CO2: Analyse the environmental and societal problems/issues and will be able to design solutions for the same.

CO3: Evaluate the existing system and to propose practical solutions for the same for sustainable development. CO4: Implement government or self-driven projects effectively in the field.

CO5: 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	20 Marks
Selection of topic, PHASE-1	
Commencement of activity and its progress –	20 Marks
PHASE – 2	
Case Study based Assessment – Individual	20 Marks
performance	
Sector wise study and its consolidation	20 Marks
Video based seminar for 10 minutes by each	20 Marks
student at the end of the course with Report	
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 – III			
	Sports (0:0:2)			
(C (Effective f	ommon to all Branches)			
Course Code	BPEK359	CIE Marks	100	
Teaching Hours/Week (L: T·P)	0:0:2	SEE Marks		
Total Number of Contact Hours	26	Exam Hours		
M	andatory Course (Non-Credit)			
(Completion of the co	ourse shall be mandatory for the a	ward of degree)		
Course Objectives: The course will ena	able students to			
1. Develop a healthy life style.				
2. Acquire Knowledge about various s	stages of sports and games.			
3. Focus on modern technology in spo	orts.			
	Module – 1			
Introduction of the game: Aim of sp	orts and games. Brief history of	the game. Nature	of the game.	
Terminology & Modern trends of the gam	e. Fitness & Skill tests along with	Game Performance.	,	
	-,	(06 Ho	ours) L1.L2.L3	
		(
	Module – 2			
Offensive and Defensive Techno Tactio	cal Abilities: Fitness, Fundamenta	als & Techniques of	the game with	
the implementation of Biomechanics, Ta	ctics- Drills for the Techno Tactica	al abilities, Individu	al and Group,	
Miner games- to implement the Techniqu	es, Tactics and Motor abilities.			
		(05 Ho	ours) L1,L2,L3	
	Module – 3			
Team tactics and Rules of the Game:	Rules and Regulations of the Gam	e. Game rules as we	ell as sequence	
of officiating Team tactics: Offensive and	Defensive team strategies and scrip	mmages Practice M	atches: among	
the group Analysis of Techno Tactical a	bilities: Correction and implement	ation of skills and s	Sports Injuries	
and rehabilitation: First aid PRICE treat	ment	ation of similaria .	sports injuries	
		(05 Ho	ours) L1.L2.L3	
		(00 110	<i>u</i> 10, <i>21</i> ,2 2 ,20	
	Module – 4			
Sports Training: Introduction of Sports	s Training, Principles of Sports p	erformance, how to	increase and	
sustain the sports performance, Tra	ining Load & Recovery- How	to increase the	training load	
(volume/Intensity) and means and met	hods for Recovery, Periodization:	Shorts, Medium an	nd Long term,	
Physiological changes: Changes in Lung	capacity, heart beats etc		C ·	
	1 57			
		(05 Ho	ours) L1,L2,L3	
	Module – 5			
Organization of Sports Event: Tournar	nent system, Planning and prepar	ation for the compe	tition, Ground	
preparation and Equipment's, Organizing	g an event among the group.			
(05 Hours) L1,L2,L3				
The above 5 modulos are common to all	the sports events / comes we ar	e offering the faller	ring gamage 1	
Baseball 2 Kabaddi 2 Tabla Tarria	and 4 Volleyball	e onering the follow	ung games: 1.	
Dascuall, 2. navauul, 3. lable lennis, 3	anu - . voncyban.			

Course outcomes:

The students will be able to:

- 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.
- 2 Develops individual and group techno tactical abilities of the game.
- 3 Increases the team combination and plan the strategies to play against opponents.
- 4 Outline the concept of sports training and how to adopt technology to attain high level performance.

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. <u>Keith A. Brown</u>, "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. <u>Michael Boyle</u>, "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. <u>MCARDLE W.D.</u> "Exercise Physiology Nutrition Energy And Human Performance" 2015, LWW IE (50)

	B.E. CIVIL ENGINEERING				
Cho	ice Based Credit System (CBCS)				
	SEMESTER – III				
	Yoga (0:0:2)				
(C	common to all Branches)				
(Effective f	rom the academic year 2023-24)		T		
Course Code	BYOK359	CIE Marks	100		
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	-		
Total Number of Contact Hours	26	Exam Hours	-		
Course Objectives:			1		
This course will enable students to:					
6. Understand the importance of pra	acticing voga in day-to-day life.				
7. Be aware of therapeutic and preve	entive value of Yoga.				
8. Have a focussed, joyful and peace	ful life.				
9. Maintain physical, mental and sp	iritual fitness.				
10. Develop self-confidence to take up	o initiatives in their lives.				
	Module – 1				
Introduction to Yoga: Introduction, cl	assical and scientific aspects of y	oga, Importance, 1	ypes, Healthy		
Lifestyle, Food Habits, Brief Rules, Sithal	ikarana Practical classes.	(04 Ho	ours) L1.L2.L3		
		(* * ***			
	Module – 2				
Physical Health. Introduction Pre-requi	sites Asana-Standing Sitting Sur	vine and Prone Prac	ctical classes		
Hysical Heaten: Infroduction, The requi	sites, risana standing, sitting, su				
		(00 10	Jursj 11,12,13		
	Module – 3				
Developing Health Introduction The	ught Forma Vrive (Vanalahhati) P	nonanation to Madit	tion		
Psychological Health: Introduction Tho	ugni Fornis, Kriya (Kapalabhati), P	reparation to medita			
Practical classes.		(06 Ho	ours) L1,L2,L3		
	Nr. 1 1. 4				
	Module – 4				
Therapeutic Yoga: Mudra Forms, Acupr	essure therapy, Relaxation techniq	ues Practical classe	es.		
		(06 Ho	urs) L1,L2,L3		
	Module – 5				
Spirituality & Universal Mantra: Introd	uction, Being Human, Universal Ma	antra, Universal LO	VE, Benefits of		
practice of Spirituality in day-to-day life,	practical classes.	(04 Hour	s) L1,L2,L3		
Course Outcomes:					
Students will be able to:		_			
1. Understand the requirement of pr	cacticing yoga in their day-to-day li	fe.			
2. Apply the yogic postures in therap	by of psychosomatic diseases				
3. Train themselves to have a focuss	ed, joyful and peaceful life.				
4. Demonstrate the fitness of Physic	al, Mental and Spiritual practices.				
5. Develops self-confidence to take u	ip initiatives in their lives.				
Teaching Practice:					
Classroom teaching (Chalk and 7	falk)				
• ICT – Power Point Presentation					
Audio & Video Visualization Tool	s				
CIE: 100 Marks					
CIE 1 for 40 marks – A theory paper	per which is MCQ / Descriptive cor	ducted during the	semester.		
 CIE 2 for 60 marks – A practical t 	est conducted at the end of the ser	nester in which the	student have		
to perform asanas.					
Textbooks					
1. George Feuerstein: The yoga Tradition	n (Its history, literature, philosophy	and practice.)			
2. Sri Ananda: The complete Book of vog	ga Harmony of Body and Mind (Or	ient paper Backs: vi	ision Books		
Pvt Ltd 1982		· r · r ·			
2 DKS Iventron Light on the Verse suite	as of nataniali (Haper Collins Publi	cations India Pyt I.	td 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

B.E. CIVIL ENGINEERING Choice Based Credit System (CBCS)					
SEMESTER - III					
	NCC (0:0:2)				
	(Common to all Branches)				
(Effe	ective from the academic year 2023	-24)			
Course Code	BNCK359	CIE Marks	100		
Teaching Hours/Week (L: T:P)	0:0:2	SEE Marks	-		
Total Number of Contact Hours	26	Exam Hours	-		
(Completion of the	Mandatory Course (Non-Credit) e course shall be mandatory for the	e award of degree)			
 Course Objectives: This course will enable students to: Understand the vision of NCC a Understand the security set up Acquire knowledge about the Ar 	nd its functioning. and management of Border/Coasta med forces and general awareness	al areas.			
	Module– 1				
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. (04 Hours) L1,L2,L3 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. (02 Hours) L1,L2,L3					
	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.(02 Hours) L1,L2,L3					
Module- 4					
Health and Hygiene: First Aid Protocols - CPR, Understanding Types of Bandages, Fire FightingField & Battle Crafts: Field Signals using hands, Judging distance -Types of Judging Distance, Sectionformations-types of Section Formation(10 Hours) L1,L2,L3					
	Module– 5				
Drill Practicals: Savdhan, Vishram,	Salute, Turning, Marching.	(08 H	Iours) L1,L2,L3		

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		
C	hoice Based Credit System (CBC	CS)	
-	SEMESTER – III)	
	Music (0:0:2)		
	(Common to all Branches)		
(Effe	ctive from the academic year 20	23-24)	
Course Code	BMUK359	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-Credi	t)	
(Completion of the c	ourse shall be mandatory for the	e award of the Degree)	
Course Objectives:			
The course will enable the students t	0:		
1. Identify the major traditions of	Indian music, both through not	ations and aurally.	
2. Analyze the compositions with	respect to musical and lyrical co	ontent.	
3. Demonstrate an ability to use	music technology appropriately	in a variety ofsettings.	
	Module – 1		
Preamble: Contents of the curriculu	am intend to promote music as	s a language to develop a	n analytical,
creative, and intuitive understanding	. For this the student must expe	eriencemusic through stud	dy and direct
participation in improvisation and con	mposition.		
Origin of the Indian Music: Evolut	ion of the Indian music system	, Understanding of	
Shruthi, Nada, Swara, Laya, Raga, Ta	la, Mela.	(03 Hours) L1,L2,L3
	Module – 2		
Compositions: Introduction to the typ	bes of compositions in Carnatic M	Iusic - Geethe, JathiSwara	ı, Swarajathi,
Varna, Krithi, and Thillana, Notation	system.		
		(03 Hours	s) L1,L2,L3
	Module – 3		
Composers: Biography and contri	butions of Purandaradasa, Tl	hyagaraja, Mysore	
Vasudevacharya.		(03 Hours) L1,L2,L3
	Module – 4		
Music Instruments: Classification a	nd construction of string instru	aments, wind instruments	s, percussion
instruments, Idiophones (Ghana Vaac	dya), Examples of each class of I	nstruments	
		(03 Hours	s) L1,L2,L3
	Module – 5		
Abhyasa Gana: Singing the swara e	xercises (Sarale Varase Only), N	Notation writing for Saral	e Varase and
Suladi Saptha Tala (Only in Mayamala Nottu Swara OR One krithi in a Mela	wagowla Raga), Singing 4 Geethe raga, a patriotic song	ein Malahari, and one Jath	i Swara, One
		(14 Hou	rs) L1,L2,L3
1			

Course Outcomes (COs):

The students will be able to:

- CO1: Discuss the Indian system of music and relate it to other genres (CognitiveDomain)
- CO2: Experience the emotions of the composer and develop empathy (AffectiveDomain)
- CO3: 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 inthree 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: APractical 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.
- 4. Carnatic Music, National Institute of Open Schooling, 2019.