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||Jai Sri Gurudev||

Sri Adichunchanagiri Shikshana Trust (R.)

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

AICTE Approved, Accredited by NAAC with A+ Grade & NBA (CSE, ISE, ECE, ME & CV), NIRF(151-300) in 2023,Gold Rated by QS I-Gauge

P.B. No.20, B.B Road, Chikkaballapur - 562 101, Karnataka

Estd : 1986

V Semester

Scheme & Syllabus of B.E. Programme

Civil Engineering

(2024 Scheme)

Core Values

Spiritual, **J**udicious, **C**ommitment, **I**ntegrity, **T**rustworthy



NATIONAL INSTITUTIONAL RANKING FRAMEWORK 151-300

GOLD

INSTITUTION'S INNOVATION COUNCIL 4-Star Rating

SJC INSTITUTEOF TECHNOLOGY,CHIKKABALLAPURA

An Autonomous Institution Under VTU from 2024 – 2025

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

SCHEME OF TEACHING AND EXAMINATION – B.E.

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

5th Semester

CIVIL ENGINEERING												
Sl. No.	**Course Code**	**Course Title**	**Course Type**	**TD/ PSB**	**Teaching Hours / Week**			**Examination**				
					L	**T**	**P**	**SEE Duration (Hrs)**	**CIE Marks**	**SEE Marks**	**Total Marks**	**Credits**
1	BCV501	Water Supply and Wastewater Treatment Engineering	PCC	Civil	3	0	0	**3**	**50**	**50**	**100**	**3**
2	BCV502	Geotechnical Engineering	IPCC	Civil	3	0	2	**3**	**50**	**50**	**100**	**4**
3	BCV503	Design of RCC Structures	PCC	Civil	3	2	0	**3**	**50**	**50**	**100**	**4**
4	BCVL504	Environmental lab	PCCL	Civil	0	0	2	**3**	**50**	**50**	**100**	**1**
5	BCV525x	Professional Elective Course – I	PEC	Civil	3	0	0	**3**	**50**	**50**	**100**	**3**
6	BCV536	Mini Project	PROJ	Civil	0	0	2	**3**	**50**	**50**	**100**	**2**
7	BRM507	Research Methodology and IPR	AEC	Civil	2	2	0	**3**	**50**	**50**	**100**	**3**
8	BCE508	Competency Enhancement Course-3	NCMC	CDCAC	0	2	0	**-**	**100**	**-**	**100**	**0**
9	BNS509	National Service Scheme (NSS)	NCMC	NSS Coordinator	0	0	2	**-**	**100**	**-**	**100**	**0**

	BPE509	Physical Education (PE) (Sports & Athletics)		Physical Education Director								
	BYO509	Yoga		Yoga Teacher								
	BMU509	Music		Music Teacher								
									550	**350**	**900**	**20**

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

Professional Elective Course – I

Course Code	Course Name	Course Code	Course Name
BCV525A	Quality Control and Quality Assurance	**BCV525C**	Matrix Method of Analysis
BCV525B	Air Pollution and Its Control	**BCV525D**	Theory of Masonry Structures

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

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

Semester: V					
Water Supply and Wastewater Treatment Engineering **Stream: CV**					
Course Code	**:**	BCV501	**Credits**	**:**	3
Hours/Week (L: T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40 L	**SEE**	**:**	50 Marks
Course Type	**:**	PCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Environmental Engineering. Environmental studies
Knowledge on Fundamental Concepts	Water, Waste water,
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Apply the concepts of water demand and water requirements for communities and the factors influencing their variation.
CLO2	Assess drinking water quality based on established standards and key water quality parameters
CLO3	Select and apply suitable treatment processes for water and wastewater considering their characteristics and desired treatment outcomes.
CLO4	Assess the applicability and operational performance of unit operations
CLO5	Develop design solutions for oxidation processes to achieve specified water and wastewater treatment objectives.

Module – 1	**08 Hrs**
Introduction: Water: Need for protected water supply, Demand of Water: Types of water demands - domestic demand, industrial, institutional and commercial demand, public use and fire demand estimation, factors affecting per capita demand, Variations in demand of water, Peak factor. Design period and factors governing design period. Methods of population forecasting and numerical problems. Physico Chemical Characteristics of water. **Text Book 1:**Ch.1	
Module – 2	**08 Hrs**
Water Treatment: Objectives, Unit flow diagrams – Significance of each unit, Aeration process Limitations and types. Sedimentation - Theory, settling tanks, types and design with numerical, Coagulation and flocculation, types of coagulants. Filtration: Mechanism, theory of filtration, types of filters: slow sand, rapid sand and pressure filters. Operation and cleaning. Design of slow and rapid sand filter without under drainage system, Numerical. **Text Book 1:**Ch.7	
Module – 3	**08 Hrs**
Disinfection: Methods of disinfection with merits and demerits. Breakpoint chlorination, Softening: Lime soda and Zeolite process. Defluoridation- Softening. **Wastewater:** Introduction: Need for sanitation, methods of sewage disposal, types of sewerage systems, **Treatment of Municipal Waste Water:** Waste Water characteristics sampling, significance and techniques, physical, chemical and biological characteristics, Numerical on BOD. **Text Book 1:**Ch.11	

Module – 4	08 Hrs
Treatment Process: Flow diagram for municipal waste water Treatment unit operations and process Screens: types, disposal. Grit chamber, oil and grease removal. Primary and secondary settling tanks. **Suspended Growth System:** conventional activated sludge process and its modifications, Numerical. **Text Book 2:**Ch.10	
Module – 5	**08 Hrs**
Attached Growth System – Trickling filter, numerical on Trickling filters, bio-towers and rotating biological contactors. Principle of stabilization ponds, oxidation ditch. Sludge digesters (aerobic and anaerobic), Thickeners and drying beds. **Text Book 1:**Ch.14	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the concepts of average and peak water demand in the planning and design of community water supply systems.
CO2	Analyze water quality parameters and evaluate their significance in environmental and public health protection
CO3	Examine the characteristics of wastewater and select appropriate treatment methods based on treatment requirements
CO4	Evaluate the functions, performance, and design considerations of various units in a wastewater treatment plan
CO5	Assess recent sewage treatment technologies, including their construction, operation, and suitability for different treatment applications

Text Books	
1	Water Supply Engineering (Environmental Engineering–I), B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Latest Reprint Edition, Laxmi Publications (P) Ltd., New Delhi, 2024, ISBN: 9788131807033.
2	Environmental Engineering, Volume I: Water Supply Engineering, S. K. Garg, 2024 Edition (Revised Reprint), Khanna Publishers, New Delhi, 2024, ISBN: 9788174091208.

Reference Books	
1	Environmental Engineering, Volume I: Water Supply Engineering, S. K. Garg2024 Edition, Khanna Publishers, New Delhi, 2024, ISBN: 9788174091208.
2	Environmental Engineering, Volume II: Sewage Disposal and Air Pollution Engineering, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Latest Reprint Edition, Laxmi Publications (P) Ltd., New Delhi, 2023, ISBN: 9788131805978.
3	Wastewater Treatment: Concepts and Design Approach Kar, 3rd Edition ,2022, I9788120346523

Web links and Video Lectures (e–Resources)	
1	**Water Supply Engineering, IIT Kharagpur:** https://nptel.ac.in/courses/105105201
2	**Wastewater Treatment and Recycling: https://www.youtube.com/watch?v=fHRxhuMQQnE&list=PLbRMhDVUMngdeOSgQOe399aBKqdxkxNCp**
3	**Wastewater Characteristics: Quality Parameters: https://www.youtube.com/watch?v=z2l3_RSucqg&list=PLbRMhDVUMngdeOSgQOe**

	399aBKqdxkxNCp&index=12
4	**Wastewater Sludge Processing and Treatment: Sludge Thickening: https://www.youtube.com/watch?v=uwF7NxXsBRE&list=PLbRMhDVUMngdeOSgQOe399aBKqdxkxNCp&index=41**

CO-PO Mapping:

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

Semester: V						
Geotechnical Engineering **Stream: CV**						
Course Code	**:**	BCV502		**Credits**	**:**	4
Hours/Week (L: T: P)	**:**	3:0:2		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L + 12 P		**SEE**	**:**	50 Marks
Course Type	**:**	IPCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Engineering Mathematics, Mechanics, Materials Science, Physics, basic Engineering principles
Knowledge on Fundamental Concepts	Knowledge of Soil Mechanics & Foundations, Analytical Skills, Communication Skills, Technical Proficiency.
Knowledge on Connected Tools (If any)	-

Course LearningObjectives: This course will enable the students to	
CLO1	Apply the basic concepts and properties of soils.
CLO2	Develop an understanding of soil formation, soil structure, clay minerals, and soil classification systems.
CLO3	Provide knowledge of seepage, permeability, and flow of water through soils and their engineering significance
CLO4	Impart the principles governing shear strength and deformation behavior of soils under various loading conditions.
CLO5	Familiarize students with soil consolidation phenomena and the evaluation of engineering properties related to settlement and foundation performance.

Module – 1	**08 Hrs**
Index Properties and is Classification Index Properties: Introduction, Origin and formation of soil, Regional soil deposits in India, Phase Diagram, phase relationships, definitions and their interrelationships. **Determination of Index Properties:** Specific gravity, water content, in-situ density, relative density, particle size analysis (sieve and Hydrometer analysis) Atterberg's Limits, consistency indices. Activity of clay, Field identification tests, Plasticity chart, BIS soil classification (IS: 1498-1970) **Text Book 1:**Ch :1-5 , **Text Book 2:**Ch :1-3, **Text Book 3:**Ch :1-3	
Module – 2	**08 Hrs**
Soil Structure, Clay Mineralogy : Soil Structure and Clay Mineralogy: Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite and their application in Engineering **Compaction of Soils:** Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control-compactive effort & method of compaction, lift thickness and number of passes, Proctor's needle, Compacting equipments and their	

suitability

Text Book 1: Ch :6 and 14, **Text Book 2:**Ch :5 and 12, **Text Book 3:**Ch :5 and 7

Module – 3	**08 Hrs**

Permeability of Soils: Darcy's law-assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity, superficial velocity and coefficient of percolation, Capillary Phenomena, quick sand phenomena.

Seepage Analysis: Laplace equation, assumptions, limitation sand its derivation. Flow nets characteristics and applications. Flow nets for sheet piles and below the dam section. Unconfined flow, phreatic line (Casagrande's method–with and without toe filter), flow through dams, design of dam filters.

Text Book 1: Ch 8-11, **Text Book 2:**Ch 8-12, **Text Book 3:**Ch 6 and 9

Module – 4	**08 Hrs**

Shear Strength of Soil: Concept of shear strength, Mohr–Coulomb Failure Criterion, Modified Mohr–Coulomb Criterion Total and effective shear strength parameters, factors affecting shear strength of soils. Thixotropy and sensitivity of soil.

Measurement of Shear Strength Parameters: Direct shear test, unconfined compression test, triaxial compression test and field Vane shear test, Test under different drainage conditions.

Text Book 1: Ch 13, **Text Book 2:**Ch8, **Text Book 3:**Ch8

Module – 5	**08 Hrs**

Consolidation of Soil: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumptions and limitations. Governing differential Equation and solution (No derivation). Consolidation characteristics of soil (Cc, Av, Mv and Cv).

Laboratory one dimensional consolidation test, characteristics of e-log (σ') curve, Pre-consolidation pressure and its determination by Casagrande's method. Over consolidation ratio, normally consolidated, under consolidated and over consolidated soils.

Determination of Consolidation Characteristics of Soils: compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method). Primary and secondary consolidation.

Text Book1: Ch 12 **Text Book 2:**Ch 7, **Text Book 3:**Ch15

PRACTICAL COMPONENT (Laboratory)

SI NO	**Experiments**
1	Determine The Water Content of Soil By: • Oven drying method • Rapid moisture meter method
2	Perform Grain Size Analysis of Soil Using Sieve Analysis Method.
3	Determine the In-Situ Density of Soil by: • Core cutter method • Sand replacement method
4	Determine the Consistency Limits 'of Soil By: • Liquid limit test using Casagrande's apparatus and cone penetration method • Plastic limit test
5	Determine the Coefficient of Permeability of Soil By: • Constant head permeability test • Variable head permeability test
6	Conduct The Standard Compaction Test (Light Compaction Only) to Determine Compaction Characteristics of Soil

7	Perform the Direct Shear Test to Determine Shear Strength Parameters of Soil.
8	Determine the Unconfined Compressive Strength of Soil and Demonstrate Laboratory Vane Shear Test.
9	Conduct Triaxial Test (Unconsolidated Undrained Test Only) to Determine Shear Strength Parameters of Soil.
10	Demonstrate the Standard Penetration Test and Boring Equipment Used in Soil Investigation.
11	Demonstrate the Working Principle and Application of Proctor's Needle.
12	Demonstrate the Working Procedure of the Laboratory Vane Shear Test to determine The Undrained Shear Strength of Soil.

Course Outcomes: After completing the course,the students will be able to	
CO1	Apply soil properties and classification systems in geotechnical engineering practice.
CO2	Analyze soil structure, clay minerals, and compaction characteristics.
CO3	Determine seepage losses across hydraulic structures using permeability and stress concepts.
CO4	Assess consolidation settlement of soils in engineering applications.
CO5	Evaluate shear strength parameters of soils using shear test data and Mohr–Coulomb theory

Text Books	
1	Soil Mechanics and Foundation Engineering, K. R. Arora, 8th Edition, Standard Publishers Distributors, New Delhi, 2017, ISBN: 9788180141120.
2	Geotechnical Engineering, C. Venkataramaiah, 6th Edition, New Age International Publishers, New Delhi, 2023, ISBN: 9789389802689.
3	Soil Mechanics and Foundation Engineering, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, 18th Edition, Laxmi Publications (P) Ltd., New Delhi, 2024, ISBN: 9789359266787.

Reference Books	
1	Soil Mechanics in Engineering Practice, Karl Terzaghi,4th Edition, Wiley India, 2023, ISBN: 9788126562538.
2	Principles of Geotechnical Engineering, Braja, 10th Edition, Cengage Learning, Boston, 2023, ISBN: 9780357859685.
3	Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering, VNS,2nd Edition (Reprint), CRC Press / Marcel Dekker, 2021, ISBN: 9780824708737.

Web links and Video Lectures (e – Resources)	
1	**Determination of Coefficient of Permeability of Soil (K) By Falling Head Method: https://www.youtube.com/watch?v=W05ZK3E4z80**
2	**How to Determine Optimum Moisture Content and Maximum Dry Density of A Soil. Compaction Test on Soil: https://www.youtube.com/watch?v=qUhB-q5eYtU**

3	**Determination of Liquid Limit of Soil (Atterberg Limits Consistency Limits) IS 2720-5 Casagrande Test: https://www.youtube.com/watch?v=ytWx4j2nHq4**

CO-PO MATRIX

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

Semester: V						
Design of RCC Structures **Stream: CV**						
Course Code	**:**	BCV503		**Credits**	**:**	04
Hours/Week (L: T:P)	**:**	3:2:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	PCC		**SEE Duration**	**:**	03 Hrs

Prerequisites:	
Courses	Elements of civil engineering, Building materials, Concrete technology, Structural Analysis
Knowledge on Fundamental Concepts	Building materials, Materials of concrete, Structural Analysis
Knowledge on Connected Tools (If any)	Relevant IS Code provisions

Course Learning Objectives: This course will enable the students to	
CLO1	Apply the basic principles of Working Stress Method (WSM) and Limit State Method (LSM).
CLO2	Analyze RC beams for flexure and shear using LSM.
CLO3	Design RC beams, slabs, and staircases as per IS codes.
CLO4	Evaluate strength and serviceability of RC members.
CLO5	Design and detail RC columns and footings.

Module – 1	**08 Hrs**
Introduction to Working Stress and Limit State Design: Introduction to working stress method, Difference between Working stress and Limit State Method of design. Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section. Limiting deflection, short term deflection, long term deflection, Calculation of deflection of singly reinforced beam only. **Text Book 1:** Ch1.1-1.5,2.1-2.7,4.1-4.14	
Module – 2	**08 Hrs**
Limit State Analysis of Beams: Analysis of singly reinforced, doubly reinforced and flanged beams for flexure and shear. **Text Book 1:** Ch 5-5.1-5.8,6.1-6.9,7.1-7.16	
Module – 3	**08 Hrs**
Limit State Design of Beams: Design of singly reinforced beams with check for shear, check for development length and other checks. Design of doubly reinforced beams and flanged sections without checks. **Text Book 1:** Ch 5-5.1-5.8,6.1-6.9, 7.1-7.16 8.1-8.11	
Module – 4	**08 Hrs**
Limit State Design of Slabs and Stairs: Introduction to one way and two-way slabs, Design of Cantilever, simply supported and one-way continuous slab. Design of two-way slabs for different boundary conditions. Design of dog legged and open well staircases **Text Book 1:**: Ch11-11.1-11.7, 12.1-12.17, 20.1-20.11	
Module – 5	**08 Hrs**

Limit State Deign of Columns and Footings: Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments, Design concepts of the footings. Design of Rectangular and square column footings with axial load. **Text Book 1**: Ch14-14.1-14.18, 22.1-22.13

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply WSM and LSM principles, safety factors, stress blocks, and serviceability requirements.
CO2	Analyze reinforced concrete beams subjected to flexure and shear using the Limit State Method and relevant IS code provisions.
CO3	Design reinforced concrete beams, slabs, and staircases in accordance with applicable IS codes.
CO4	Evaluate deflection, development length, anchorage, and serviceability requirements.
CO5	Design and detail RC columns and footings as per IS code provisions.

Text Books	
1	Limit State Design of Reinforced Concrete, P. C. Varghese, 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2019, ISBN: 9788120320390.
2	Design of Reinforced Concrete Structures, N. Subramanian, 1st Edition, Oxford University Press, New Delhi, 2019, ISBN: 9780198086949.

Reference Books	
1	Reinforced Concrete Design to Eurocode 2, W. H. Mosley, R. Hulse and J. H. Bungey,7th Edition, Palgrave Macmillan, 2012, ISBN: 9780230500716.
2	Reinforced and Prestressed Concrete, F. K. Kong and R. H. Evans, 3rd Edition, CRC Press/Taylor & Francis, 2012, ISBN: 9780230302853.

Web links and Video Lectures (e – Resources)	
1	**Design of Reinforced Concrete Structures, IIT Kharagpur:** https://nptel.ac.in/courses/105105105
2	**Reinforced Concrete :**https://www.youtube.com/watch?v=vrzDa1rvDjA
3	**Introduction to Limit State Method of R.C Structures Design:** https://www.youtube.com/watch?v=d71tPGwEAio

CO – PO MAPPING

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

Prerequisites:			**Semester:V**			
Courses			**Environmental Lab**	Environmental engineering		
Knowledge on Fundamental Concepts			**Stream: CV**	Water and waste water characteristics and treatment		
Course Code	:	BCVL504		**Credits**	:	1
Knowledge on Connected Tools (If any)						
Hours/Week(L:T:P)	:	0:0:2		**CIE** --	:	50 Marks
Total Hours	:	12 P		**SEE**	:	50 Marks
Course Type	:	PCCL		**SEE Duration**	:	3 Hours

Course Learning Objectives: This course will enable the students to	
CLO1	Determine the physical, chemical, and biological characteristics of water, wastewater and industrial effluents.
CLO2	Evaluate water and wastewater quality test results and their implications for treatment and environmental management.
CLO3	Develop practical skills in conducting standard laboratory experiments related to water and wastewater quality assessment
CLO4	Apply environmental engineering concepts to laboratory investigations, data interpretation and project-based problem solving
CLO5	Compare experimental results with established standards and guidelines to assess water and wastewater quality.

Exp. No.	**Name of the Experiment**
1.	Determination of pH, Turbidity .
2.	Determination of Alkalinity & Acidity
3.	Determination of Chlorides
4.	Determination of Total Solids, Suspended Solids, Volatile Solids, Fixed Solids, Settle able Solids.
5.	Determination of Conductivity and Total dissolved solids
6.	Determination of Calcium, Magnesium and Total Hardness.
7.	Determination of Dissolved Oxygen
8.	Determination of B.O. D
9.	Determination of Available Chlorine in a sample of bleaching powder and Determination of Residual Chlorine
10.	Determination of Optimum Coagulant Dose.

Course Outcomes: After completing the course,the students will be able to	
CO1	Determine the concentration of various water and wastewater quality parameters.
CO2	Estimate major ions present in water and interpret their significance in water quality assessment and treatment processes.
CO3	Compare experimental results against relevant standards and justify their suitability based on the intended purpose of analysis.
CO4	Determine the appropriate type and degree of treatment required for water and wastewater based on quality characteristics and treatment objectives.
CO5	Select relevant environmental parameters for analysis in project work related to water, wastewater, and environmental engineering applications.

Reference Books	
1	Lab Manual, ISO 14001 Environmental Management, Regulatory Standards for Drinking Water and Sewage disposal. ISBN-13: 978-0131994072
2	Chemistry for Environmental Engineering and Science , Clair Sawyer and Perry McCarty and Gene Parkin, McGraw-Hill Series in Civil and Environmental Engineering, ISBN, 0071230459,
3	IS: 10500:2012 Drinking Water - Specification, Second revision, Bureau of Indian Standards, 2012.

Web links and Video Lectures (e – Resources)	
1	**Water Quality Testing Methods: https://www.youtube.com/watch?v=7rjDhyWtKgQ**
2	**Wastewater Characterization: https://www.youtube.com/watch?v=0LHVDwLDxhM**
3.	**Water Quality Sampling and Analysis: https://www.youtube.com/watch?v=LU6Mwmi49eo**

CO – PO MAPPING

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

Semester: V						
Quality Control and Quality Assurance **Stream: CV**						
Course Code	**:**	BCV525A		**Credits**	**:**	03
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	PEC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Construction Management
Knowledge on Fundamental Concepts	Construction methodology, Material properties & testing.
Knowledge on Connected Tools (If any)	NDT equipment's, MS Excel

Course Learning Objectives: This course will enable the students to	
CLO1	Apply the principles and significance of quality management in construction.
CLO2	Analyze the concept of quality in construction projects.
CLO3	Interpret standards and regulations related to construction quality management.
CLO4	Implement Quality Assurance (QA) and Quality Control (QC) programs.
CLO5	Evaluate the importance of Quality Management Systems (QMS) in Civil Engineering.

Module – 1	**08 Hrs**
Quality Aspects of Construction Materials – Quality History, Quality Definition, Quality Inspection, Quality Control, Quality Assurance, Specifications and Tolerances, Inspection of Materials and Machinery, Preparation of Quality Manuals, Checklist and Inspection Report, Establishing Quality Assurance System.**Text Book 1:** Ch.1	
Module – 2	**08 Hrs**
Quality Management: Management Practices: TQM, Vision and Quality policy, Quality Function Deployment, Bench marking and performance evaluation, ISO 9000 Quality Management System, ISO 14000 Environmental Management System **Text Book 1:** Ch.3 & 4 **Text Book 3:** Ch.2	
Module – 3	**08 Hrs**
Statistical Quality Control: Importance of SQC in construction, Statistical parameters: sampling, population and sampling, measure of variability, measure of central tendency, Recommendations of IS 456:2000 on sampling, testing and acceptance criteria for concrete. **Text Book 2:** Ch.17-20	
Module – 4	**08 Hrs**
QA and QC in Construction: Errors in concrete construction; Frequency of material testing and reporting of basic construction materials (cement, sand, coarse aggregate, bricks, steel), Norms for accepting and rejecting criteria of basic construction materials as per relevant IS codes. **Text Book 1:** Ch.8, **Text Book 3:** Ch.5	
Module – 5	**08 Hrs**
On-Site Quality: Achieving quality at different stages of construction: Conceptual Design, Preliminary Design, Detailed Design, Construction, Testing, Commissioning, and Handover. Quality assessment of concrete through NDT: rebound hammer and USPV tests and guidelines for accepting and rejecting.	

Text Book 2: Ch.15,	**Text Book 3:** Ch.6, IS 516 Part 1 to Part 4

Course Outcomes: After completing the course,the students will be able to	
CO1	Apply quality management principles and practices in construction projects to achieve desired quality objectives.
CO2	Analyze construction project scenarios using quality management principles, tools, and techniques for effective decision-making.
CO3	Examine and apply Statistical Quality Control (SQC) techniques for monitoring and improving construction quality.
CO4	Implement Quality Management System (QMS) programs at various stages and levels of construction projects.
CO5	Evaluate construction quality through testing procedures, quality engineering practices, and performance assessment methods.

Text Books	
1	The Management of Quality in Construction, John L. Ashford, 1st Edition (The, Routledge Publications, 2016, ISBN: 9780419149101.
2	Juran's Quality Planning and Analysis for Enterprise Quality, Joseph M. Juran, Frank M. Gryna and Richard C. Chua, 6th , McGraw-Hill Education, 2010, ISBN: 9780071629737.
3	Concrete and Steel Construction: Quality Control and Assurance, Mohamed A. El-Reedy,1st Edition, CRC Press, Taylor & Francis Group, 2014, ISBN: 9781466577947.

Reference Books	
1	Concrete Technology: Theory and Practice, M. S. Shetty, 9th Edition, S. Chand Publishing, New Delhi, 2020, ISBN: 9789358700671.
2	Indian Standard Codes for Construction Quality Control and Testing (IS 456:2000, IS 10262:2019, IS 383:2016, IS 516 Series,

Web links and Video Lectures (e – Resources)	
1	**Mastering Construction Quality Assurance and Quality Control: https://www.youtube.com/watch?v=cwGm6S1Jed4**
2	**Water Supply Engineering, IIT Kharagpur:** https://nptel.ac.in/courses/105104161
3	**Total Quality Management:** https://nptel.ac.in/courses/110104080

CO – PO MAPPING

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

Semester: V						
Air Pollution and Its Control **Stream: CV**						
Course Code	**:**	BCV525B		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	PEC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Environmental studies
Knowledge on Fundamental Concepts	Air composition, Pollutants, Emissions, Energy
Knowledge on Connected Tools (If any)	**----**

Course Learning Objectives: This course will enable the students to	
CLO1	Apply the principles and design of control systems for indoor, particulate, and gaseous air pollutants, including emerging trends.
CLO2	Select appropriate equipment for air pollution control.
CLO3	Analyze the nature and characteristics of air pollutants.
CLO4	Assess plume behavior and meteorological variables affecting air pollution.
CLO5	Evaluate noise pollution and the basic concepts of air quality management.

Module – 1	**08 Hrs**
Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Types of inversion, photochemical smog **Text Book 1:** Ch.1: 1.1 – 1.9	
Module – 2	**08 Hrs**
Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths. **Text Book 1:** Ch.2: 2.1 – 2.16	
Module – 3	**08 Hrs**
Control of Particulate Contaminants: Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle - Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators, Site selection for industrial plant location. **Text Book 2:** Ch.3-7	
Module – 4	**08 Hrs**
Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SOX, NOX, CO, NH3). Development of air quality models-Gaussian dispersion model-Including Numerical problems. **Text Book 1:** Ch.4: 4.1 – 4.11	
Module – 5	**08 Hrs**
Control of Gaseous Contaminants: Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring **Air Pollution Due to Automobiles:** Air pollution due to automobiles, standards and control	

methods. Noise pollution- causes, effects and control, noise standards. Environmental issues, global episodes. Environmental laws and acts.
Text Book 1: Ch.5-8

Course Outcomes: After completing the course,the students will be able to	
CO1	Apply knowledge of air pollution sources to assess their impacts on health and the environment.
CO2	Analyze atmospheric pollutant dispersion and develop air quality models.
CO3	Design control techniques for particulate and gaseous emissions.
CO4	Evaluate sampling techniques for atmospheric and stack pollutants.
CO5	Formulate solutions for air and noise pollution problem.

Text Books	
1	Air Pollution, M. N. Rao and H. V. N. Rao, 2nd Edition, Tata McGraw-Hill Education, New Delhi,2018 Reprint, ISBN: 9780074518717.
2	Air Pollution Control Engineering, Christmas of Nevers ,3rd Edition, Waveland Press Inc., Illinois, 2017, ISBN: 9781478629054.

Reference Books	
1	Air Pollution, H. C. Perkins, 1st Edition (Latest Reprint), McGraw-Hill Book Company, New York, 2015 Reprint, ISBN: 9780070492011.
2	Air Pollution and Control Technology, Y. Anjaneyulu, 3rd Edition, BS Publications, Hyderabad, 2, ISBN: 9789387593428.
3	Introduction to Environmental Engineering, quirk, 6th Edition, McGraw-Hill Education, New York, ISBN: 9781260575549.

Web links and Video Lectures (e – Resources)	
1	**Air Pollution and Control By Prof. Bhola Ram Gurjar, I.I.T. Roorkee:** **https://www.youtube.com/watch?v=5dukz1UOtkA&list=PLLy_2iUCG87BwOQUbS7WSdMVWHDXByk-w**
2	**Impact of Air Pollution on Human Health:** **https://www.youtube.com/watch?v=z4YFkK3Wtsg&list=PLLy_2iUCG87BwOQUbS7WSdMVWHDXByk-w&index=4**
3	**Air Pollution Due to Automobiles:** **https://www.youtube.com/watch?v=tsvBXUQWAOU**

CO – PO MAPPING

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

Semester: V						
Matrix Method of Analysis **Stream: CV**						
Course Code	**:**	BCV525C		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3: 0: 0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	PEC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Engineering Mathematics, Strength of Materials, Structural Analysis
Knowledge on Fundamental Concepts	Matrix, Types of supports and loads, Indeterminacy, degree of freedom and redundancy.
Knowledge on Connected Tools (If any)	STAAD Pro.

Course LearningObjectives: This course will enable the students to	
CLO1	Differentiate the concepts of flexibility and stiffness matrices for structural system problems.
CLO2	Analyze engineering problems using flexibility and stiffness matrices as applied to continuous beams, rigid frames, and trusses.
CLO3	Implement the direct stiffness method for numerical analysis of continuous beams and trusses.
CLO4	Evaluate the effects of temperature changes and lack of fit on structural systems.
CLO5	Demonstrate the application of the direct stiffness method to solve structural analysis problems.

Module – 1	**08 Hrs**
Introduction: Structural systems, geometric and material non-linearity, principle of superposition, equilibrium and compatibility conditions, static and kinematic indeterminacy, principle of minimum potential energy, concepts of stiffness and flexibility, flexibility and stiffness matrices of beam and truss elements. **Text Book 1:** Ch.2: 1.1 – 1.13 **Text Book 2:** Ch.2: 2.1 – 2.6, Ch.3: 3.1, 3.2, Ch.7: 7.1-7.3.	
Module – 2	**08 Hrs**
Element Flexibility Method: Force transformation matrix, global flexibility matrix, analysis of continuous beams, rigid frames and trusses. **Text Book 1:** Ch.2: 2.1 – 2.7 **Text Book 2:** Ch.8: 8.1-8.5	
Module – 3	**08 Hrs**
Element Stiffness Method: Displacement transformation matrix, global stiffness matrix, analysis of continuous beams, rigid frames and trusses. **Text Book 1:** Ch.3: 3.1 – 3.3 **Text Book 2:** Ch.9: 9.1-9.6.4	
Module – 4	**08 Hrs**
Effects of Temperature Changes and Lack of Fit: Related numerical problems by flexibility and stiffness method as in Module 2 and Module 3. **Text Book 1:** Ch.3: 3.3 – 3.6 **Text Book 2:** Ch.9: 9.6.5-9.6.8	
Module – 5	**08 Hrs**

Direct Stiffness Method: Local and global coordinates systems, global stiffness matrices of beam and truss elements, analysis of continuous beams and trusses. **Text Book 1:** Ch.4: 4.1 – 4.18 **Text Book 2:** Ch.10: 10.1-10.12

Course Outcomes: After completing the course,the students will be able to	
CO1	Interpret concepts of flexibility and stiffness.
CO2	Apply element flexibility method for analysisof beam, frame and truss.
CO3	Examine beam, frame and truss by element stiffness method.
CO4	Analyze beam and truss subjected to lack of fit and change in temperature by flexibility and stiffness method.
CO5	Evaluate beam and truss using direct stiffness method.

Text Books	
1	Matrix Analysis of Framed Structures, Weaver W and Gere J H, Third edition,CBS publications, New Delhi. ISBN-13: 978-1-4684-7489-3
2	Computational Structural Mechanics, S. Rajasekaran, Reprint Edition, PHI Learning Pvt. Ltd., New Delhi, 2017, ISBN: 9788120317345.

Reference Books	
1	Matrix Method of Structural Analysis, P. N. Godbole, S. U. Dhote and A. B. Gupta, 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2014, ISBN: 9788120349841.
2	Structural Analysis: A Matrix Approach, G. S. Pandit and S. P. Gupta, 3rd Edition, McGraw Hill Education India, 2020, ISBN: 9789353168063.

Web links and Video Lectures (e – Resources)	
1	**Matrix Method of Structural Analysis: https://www.youtube.com/watch?v=Wa9ZSWlrpnk&list=PLbRMhDVUMngeZatm4MIOKG4sHxXuB_yri**
2	**Matrix Method of Analysis Element Stiffness Method:** https://www.youtube.com/watch?v=2-7G35K_KD8&list=PLYo9pk0CURkuy9VBUSm5XCnj71_WsesNJ
3	**Effects of Temperature Changes and Lack of Fit: https://www.youtube.com/watch?v=dquhZSjtiYw**

CO-PO MAPPING

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

Semester: V						
Theory of Masonry Structures **Stream: CV**						
Course Code	**:**	BCV525D		**Credits**	**:**	3
Hours/Week (L: T: P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	PEC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Design of Concrete Structures, Strength of Materials, Structural Analysis
Knowledge on Fundamental Concepts	Structural behaviour under loads, Stress – strain relationship
Knowledge on Connected Tools (If any)	Relevant IS codes provision

Course Learning Objectives: This course will enable the students to	
CLO1	Explore the properties and behavior of masonry materials and units.
CLO2	Assess the strength and stability of masonry walls under axial and eccentric loads.
CLO3	Design of masonry walls under axial loads.
CLO4	Analyze design concepts to laterally and transversely loaded masonry structures.
CLO5	Interpret permissible stress limits and the behaviour of complex masonry constructions.

Module – 1	**08 Hrs**
Masonry Units: Materials, types and masonry construction: Bricks, Stone and Block masonry units- strength, modulus of elasticity and water absorption of masonry materials–classification and properties of mortars. Defects and Errors in masonry construction – cracks in masonry, types, reason for cracking, methods of avoiding cracks. **Strength and Stability:** Strength and stability of axially loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship. Compressive strength formulae based on elastic theory and empirical formulae.**Text Book 1:**:Ch.1 to 10, **Text Book 2:**Ch.1 to 5	
Module – 2	**08 Hrs**
Permissible Stresses: Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral load, permissible tensile stress and shear stresses. **Design Considerations:** Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls, cavity walls, wall with pillars. **Text Book 1:**Ch.1 to 10, **Text Book 2:**Ch.1 to 5	
Module-3	**08 Hrs**
Load Considerations and Design of Masonry Subjected to Axial Loads: Design criteria, design examples of walls under UDL, solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers. **Text Book 3:**Ch.2 to 9	
Module – 4	**08 Hrs**
Design Of Walls Subjected to Concentrated Axial Loads: Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers, design of wall with openings. **Design of Walls Subjected to Eccentric Loads:** Design criteria – stress distribution under eccentric loads–Problems on centrically loaded solid walls, cavity walls, walls with piers. **Text Book 4:** Ch.12	
Module – 5	**8 Hrs**

Design of Laterally and Transversely Loaded Walls: Design criteria, design of solid wall under wind loading, design of shear wall – design of compound walls, Introduction to reinforced brick masonry, lintels and slabs. **In-Filled Frames:** Types – modes of failures – design criteria of masonry retaining walls. **Text Book 3:**Ch: 2 to 9

Course Outcomes: After completing the course,the students will be able to	
CO1	Assess the engineering properties of masonry materials and select suitable materials for various structural applications
CO2	Analyze the behavior, strength, and stability of masonry walls under different loading and support conditions.
CO3	Design load-bearing masonry walls subjected to axial and eccentric loads in accordance with permissible stress design principles and relevant codal provisions.
CO4	Design masonry wall systems, including shear walls, to safely resist lateral loads as per applicable design standards
CO5	Evaluate advanced masonry structural elements such as infilled frames, lintels, slabs and retaining walls using engineering principles and code-based requirements.

Text Books	
1	Design of Masonry Structures, B. P. Sinha and S. R. Davies, 1st Edition, CRC Press, London, 1997, ISBN: 9780419215608.
2	Structural Masonry, K.S,1st Edition, I.K. International Publishing House Pvt. Ltd., New Delhi, 2015, ISBN: 9789384588663.
3	Structural Masonry, A. W. Hendry, 2nd Edition, Palgrave Macmillan, London, 1998 ISBN: 9780333733097.
4	Masonry Structures: Behaviour and DesignJames G. Drysdale, Ahmed A. Hamid and Lawrence R. Baker, 2nd Edition, Pearson Education,1994, ISBN: 9780135620267.

Reference Books	
1	Building Construction Handbook, Roy Chudley and Roger Greeno, 13th Edition, Routledge, London, 2024, ISBN: 9781032750828.
2	Reinforced Masonry Engineering Handbook: Clay and Concrete MasonryJames E. Amrhei6th Edition, Masonry Institute2015, ISBN: 9780940116924.
3	Design of Reinforced Concrete and Brick Masonry Structures, Alarmelumangai and EllissYogesh2nd, We202,9789391070124.
4	Structure, W. G. Curtin, A. Shaw, J. Beck and R. M. Atkins, 4th Edition,2, I9781118839410.

Web links and Video Lectures (e – Resources)	
1	**Masonry Units Used in Construction:** **https://www.youtube.com/watch?v=LRPz2smUiOA**
2	**Masonry Units: Design Of Walls Subjected to Concentrated Axial Loads:** **https://www.youtube.com/watch?v=Cjh-VvJ7ul8&list=PLHBBC5jY93PokJU-rg6Elpw8_vgLgtLFO**
3	**Masonry Restraint Design Tutorial - Structural Engineering:** **https://www.youtube.com/watch?v=bGjPOoQGcRw**

CO-PO Mapping

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

Semester: V						
Mini Project **Stream: CV**						
Course Code	**:**	BCV536		**Credits**	**:**	2
Hours/Week(L:T:P)	**:**	0:0: 2		**CIE**	**:**	50Marks
Total Hours	**:**	30 L		**SEE**	**:**	50Marks
Course Type	**:**	PROJ		**SEE Duration**	**:**	3 Hours

Course Learning Objectives: This course will enable the students to	
CLO1	Apply engineering principles and domain knowledge to solve real world or research problems.
CLO2	Design engineering solutions using appropriate tools and technologies for identified problems.
CLO3	Apply project planning and management techniques to achieve project objectives within specified constraints.
CLO4	Analyze ethical, professional, societal, and sustainability considerations in engineering practice.
CLO5	Apply teamwork and technical communication skills in the execution and presentation of engineering projects.

CIE procedure for Project Work:

1) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.
The CIE marks awarded for the project work, shall be based on the evaluation of the project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

2) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze a civil engineering problem using fundamental principles and domain knowledge.
CO2	Evaluate existing literature to identify research gaps and establish project objectives.
CO3	Design a systematic project plan incorporating methodology, design approach, and implementation milestones.
CO4	Apply modern engineering tools and software for analysis and design of civil engineering systems.
CO5	Demonstrate professional ethics, teamwork, and technical communication skills during project execution and reporting.

CO – PO MAPPING

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

Semester: V					
Research Methodology and IPR (Common to all Branches)					
Course Code	:	BRM507	**Credits**	:	3
Hours/Week (L: T :P)	:	2:2:0	**CIE**	:	50 Marks
Total Hours	:	40 L	**SEE**	:	50 Marks
Course Type	:	AEC	**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Engineering / Technical Communication
Knowledge on Fundamental Concepts	Fundamentals of engineering problem solving, technical report writing, information retrieval, analytical thinking, and professional ethics
Knowledge on Connected Tools (If any)	Familiarity with web search engines, digital libraries, scholarly databases (e.g., Google Scholar), reference management tools, and basic office productivity software

Course Learning Objectives: This course will enable the students to	
CLO1	Familiarize students with research methodologies, problem formulation, and research ethics.
CLO2	Equip students with techniques for literature search, review, and analysis using scholarly databases.
CLO3	Strengthen technical reading and interpretation skills for research documents, algorithms, and datasets.
CLO4	Introduce Intellectual Property Rights and innovation protection procedures.
CLO5	Enhance awareness of IP management, commercialization, and significant IPR case studies.

Module – 1	**08Hrs**
Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. **Text Book 1**: **Ch. 1, Ch. 2**	
Module – 2	**08Hrs**
Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet. Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments. **Text Book 1**: **Ch. 3, Ch. 4**	
Module – 3	**08Hrs**
Introduction To Intellectual Property: Role of IP in the Economic and Cultural, Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India. Patents: Conditions for Obtaining a Patent Protection. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public	

Disclosure of an Invention before Patenting. Process of Patenting. Process of Patenting. Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models**.**

Text Book 1: **Ch. 2**

Module – 4	**08Hrs**

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Fair Use Doctrine. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. @#@26092024 Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. Interesting Copyrights Cases. Trademarks: Eligibility Criteria. Acts and Laws. Classification of Trademarks. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. Prior Art Search. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.

Text Book 1: **Ch. 3**

Module – 5	**08Hrs**

Industrial Designs: Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Enforcement of Design Rights. Non-Protectable Industrial Designs India. Protection Term. Procedure for Registration of Industrial Designs. Prior Art Search. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Application Forms. Classification of Industrial Designs. Designs Registration Trend in India. International Treaties. Famous Case Law: Apple Inc. vs. Samsung Electronics Co. Geographical Indications: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India. Identification of Registered GI. Classes of GI. Non-Registerable GI. Protection of GI. Collective or Certification Marks. Enforcement of GI Rights. Procedure for GI Registration Documents Required for GI Registration. GI Ecosystem in India. Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent. IP Organizations in India. Schemes and Programmes.

Text Book 1: **Ch. 4, Ch. 7**

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply research methodologies and ethical practices to address engineering research problems.
CO2	Analyze technical literature and synthesize research findings using appropriate citation practices.
CO3	Interpret research articles, algorithms, datasets, and technical documents in computing domains.
CO4	Implement intellectual property rights procedures for protecting technological innovations
CO5	Evaluate intellectual property case studies and determine suitable protection strategies for research outcomes

Textbooks	
1	Research Methodology: Methods and Techniques, C.R. Kothari and Gaurav Garg, 5th Edition, New Age International Publishers, 2024. ISBN: 9389802555

2	Intellectual property rights under WTO, T Ramappa, 2nd revised edition, Asia Law House Publisher, 2016, ISBN: 9385556819

Reference Books	
1	Research Methodology: A Step-by-Step Guide for Beginners, Ranjit Kumar, SAGE Publications 2018, ISBN: 9781526457080
2	Principles of Intellectual Property, Dr. N. S. Gopalakrishnan and T. G. Agitha, Eastern Book Company Publisher, 3rd edition, 2023. ISBN: 9788170121572

Web links and Video Lectures (e – Resources)	
1	https://online.vtu.ac.in/course/1-research-methodologies-and-ipr
2	https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr24_ed08

CO – PO MAPPING

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

Semester: V						
Competency Enhancement Course - 3						
Course Code	:	BCE508		**Credits**	:	0
Hours/Week(L:T:P)	:	0:2:0		**CIE**	:	100 Marks
Total Hours	:	40 L		**SEE**	:	-
Course Type	:	NCMC		**SEE Duration**	:	-

Prerequisites:	
Courses	Fundamentals of C Programing
Knowledge on Fundamental Concepts	Programming fundamentals, including variables, data types, control structures (if, loops), and syntax
Knowledge on Connected Tools	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Apply fundamental programming concepts using C language.
CLO2	Develop object-oriented programs using C++.
CLO3	Construct and debug multi-file programs in C and C++.
CLO4	Implement database design and management techniques using SQL in Oracle and MySQL.
CLO5	Analyze and compare different database models, including RDBMS and NoSQL databases.

Module – 1	**8 Hrs**
C programming (A): Data Types, Operators and Expressions Input and output Operations Control Flow – Branching, Control Flow – Looping, Statements and Blocks, If Else, Switch, Nesting of If Else, GOTO statement, The while statement, The For statement, The Do statement, Jumps in loops **C programming (B):** Arrays, Strings, One-dimensional arrays, Initialization of one-dimensional arrays, Two-dimensional Arrays, Initializing Two-dimensional arrays, Multi-dimensional arrays, Dynamic arrays, Declaring and Initializing string variables, Reading Strings from Terminal, Writing Strings to screen, String handling functions, Operations on strings **C programming (C):** User-defined Functions, Structures, Basics of Functions, Functions Returning Non-integers, External Variables, Scope Rules, Header Files, Static Variables, Register Variables, Block Structure, Initialization, Recursion, Category of functions, Functions that return multiple values, Nesting functions, Multi-file programs, Structures and Functions, Arrays of Structures, Pointers to Structures, Self-referential structures **Text Book 1:** Ch.1-11	
Module – 2	**8 Hrs**
C Programming (D): Unions, Pointers, Difference between Structures and Unions, Accessing the address of a variable, Declaring and Initializing pointer variables, Accessing a variable through its pointers, Chain of pointers, Pointer Expressions, Pointer Increments and Scale Factors, Pointers and character strings, Array of pointers, Pointers as function arguments, Functions returning pointers, Pointers to functions, Drawback of Pointers **File Management in C:** The Preprocessor, Defining and Opening a File, Closing a File, Input / Output Operations on Files, Random Access to Files, Command Line Arguments. Macro Substitution, File Inclusion, Compiler Control Directives, ANSI Additions **Text Book 1**: Ch.2-16	
Module-3	**8 Hrs**

C++: Object oriented Programming, Class and Objects, Dynamic Memory Management POP,OOPs in C++, Console Input / Output in C++, Comment lines in C++, Importance of function prototyping in C++, Function overloading, Inline functions and default arguments **Text Book 2:** Ch.1-6

Module-4	**8 Hrs**
C++: Scope Resolution Operator, Structures, Defining function outside the class , Friend functions, Friend class, Array of class objects, Passing class objects to and returning class objects from functions, Nested classes, Namespaces, Dynamic memory allocation using new and deallocation, new handler function **Text Book 2**: Ch.7-11	

Module-5	**8 Hrs**
Database Management System : Types of DBMS – Merits and Demerits Oracle and MySQL, SDLC, Architecture (Oracle 10g) - Instance, User Accounts, Client Applications IP, Port Number, SQL Introduction Tables, DDL and DML, Pluggable Databases – Oracle 19c, Architecture Undo and Redo, Operators Constraints Sequences Triggers, Functions – Conversion, String, Math, Aggregate Clauses, Joins, Views, Synonyms, Indexes Stored Procedures, Normalization, Triggers and stored procedures, NoSQL Db, normalisation – tables **Text Book 3:** Ch.1-8	

Course Outcomes: After completing the course,the students will be able to	
CO1	Apply C programming concepts to solve engineering problems.
CO2	Develop modular C programs using functions, pointers, structures, and files.
CO3	Implement object-oriented programming concepts using C++.
CO4	Design and manage databases using SQL, normalization, and stored procedures.
CO5	Integrate C/C++ programs with databases for efficient data management.

Text Books	
1	Let Us C, YashavantKanetkar, 19th Edition, BPB Publications, 2023, ISBN: 978-9355516558.
2	Object-Oriented Programming with C++, E. Balagurusamy, 9th Edition, McGraw Hill Education India, 2024, ISBN: 978-9364304696.
3	Database System Concepts, Abraham Silberschatz, Henry F. Korth and S. Sudarshan, 7th Edition, McGraw Hill Education, 2019, ISBN: 978-1260084504.

Reference Books	
1	Programming in ANSI C, E. Balagurusamy, 8th Edition, McGraw Hill Education India, 2019, ISBN: 978-9353165130.
2	The C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, 2nd Edition (Reprint), Pearson Education India, 2015, ISBN: 978-9332549449.

Web links and Video Lectures (e – Resources)	
1	https://www.softprayog.in/programming/c-programming-tutorial-data-types-and-expressions
2	https://www.geeksforgeeks.org/array-of-strings-in-c/
3	https://www.programiz.com/c-programming/c-structures-pointers
4	https://www.w3schools.com/cpp/cpp_oop.asp
5	https://www.geeksforgeeks.org/dbms/

CO – PO MAPPING

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

Semester: V						
National Service Scheme(NSS)						
Course Code	**:**	BNS509		**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:0:2		**CIE**	**:**	100 Marks
Total Hours	**:**	24 L		**SEE**	**:**	-
Course Type	**:**	NCMC		**SEE Duration**	**:**	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the community in general in which they work
CLO2	Identify the needs and problems of the community and involve them in problem – solving
CLO3	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions t
CLO4	Develop teamwork, leadership, responsibility-sharing, and community participation skills with democratic.
CLO5	Appraise the importance of ethical issues and team working abilities pertaining to the social services.

Activity– 1	**06 Hrs**
Developing Sustainable Water management system for rural areas and implementation approaches.	
Activity – 2	**06 Hrs**
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.	
Activity – 3	**06 Hrs**
Spreading public awareness under rural outreach programs. (Minimum 3 programs).	
Activity – 4	**06 Hrs**
Social connect and responsibilities.	

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

Sl.	**Topic**	**Group Size**	**Location**	**Activity Execution**	**Reporting**	**Evaluation of the Topic**
1.	Developing Sustainable Water management system for rural areas and implementation approaches.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.	Site selection /proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
2.	Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India,	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes	Group selection /proper consultation/ Continuous monitoring/ Information	Report should be submitted by individual to the concerned	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

	Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.		officers/ campus etc.	board	evaluation authority	
3.	Spreading public awareness under rural outreach programs. (minimum5 programs).	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.	Group selection/proper consultation/ Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
4.	Social connect and responsibilities.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.	Group selection/proper consultation/ Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

Plan of Action (Execution of Activities for 5th Semester)

Sl. No.	Practice Session Description
1.	Lecture session by NSS Officer
2.	Selection of topic, Commencement of activity and its progress
3.	Execution of Activity
4.	Case study-based Assessment, Individual performance
5.	Sector wise study and its consolidation
6.	Video based seminar for 10 minutes by each student At the end of semester with Report.

- In the 5th semester, each student should do activities according to the scheme and syllabus.
- At the end of the semester student performance has to be evaluated by the NSS Officer for the assigned activity progress and its completion.
- At the end of the 5th semester, consolidated report of all activities compiled report should be submitted as per the instructions.

Cours eOutcomes :After completing the course, the students will be abl eto	
CO1	Exploit the importance of his / her responsibilities towards society.
CO2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
CO4	Implement government or self-driven projects effectively in the field of societal problems.
CO5	Appraise the importance of ethical issues and team working abilities pertaining to the social services.

Assessment Details for CIE (100 Marks)

Weightage	CIE- 100 Marks
Selection of Topic, Commencement of activity and its progress	40 Marks
Case study-based Assessment	20 Marks
Sector wise study and its consolidation	20 Marks
Video based seminar for 10 minutes by each student at the end of semester with Report	20 Marks
Total Marks for the course in the semester	100 Marks

Suggested Learning Resources:

Books:

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

CO-PO Matrix

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

Semester: V						
Physical Education (PE) (Sports & Athletics)						
Course Code	**:**	BPE509		**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:0:2		**CIE**	**:**	100 Marks
Total Hours	**:**	24 L		**SEE**	**:**	-
Course Type	**:**	NCMC		**SEE Duration**	**:**	-

Course Learning Objectives: This course will enable the students to	
CLO1	Impart foundational knowledge on the importance of physical fitness, food, and nutrition for a healthy lifestyle and personal well-being.
CLO2	Develop awareness and proficiency in general fitness components such as agility, flexibility, and cardiovascular endurance through standardized physical fitness tests.
CLO3	Enhance motor skills and techniques in a selected sport (Badminton, Basketball, or Athletics) through structured practice and application of fundamental game-specific skills.

Module – 1	**4 Hrs**
Orientation A. Fitness B. Food & Nutrition	
Module – 2	**4 Hrs**
General Fitness & Components of Fitness A. Agility – Shuttle Run B. Flexibility – Sit and Reach C. Cardiovascular Endurance – Harvard step Test	
Module-3	**16 Hours**
Specific games (Anyone to be selected by the student) A. Badminton (Fore hand low/high service, back hand service, smash, drop) B. Basketball (Dribbling, passing, shooting etc.) C. Athletics (Field events – Throws)	

Course Outcomes :After completing the course, the students will be able to	
CO1	Understand the fundamentals of fitness, food and nutrition and their role in a healthy lifestyle.
CO2	Demonstrate understanding of general fitness components such as agility, flexibility and cardiovascular endurance through standard fitness tests
CO3	Apply basic techniques, rules and strategies in the chosen sport (Badminton, Basketball, or Athletics)
CO4	Develop sport-specific skills to enhance performance in both practice and competitive situations
CO5	Exhibit teamwork, discipline and sportsmanship during training and game play

Scheme and Assessment for auditing the course and Grades:

Sl.No.	**Activity**	**Marks**
1.	Participation of student in all the modules	20
2.	Quizzes–2,each of 15marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

CO – PO MAPPING

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

Semester: V						
Yoga						
Course Code	:	BYO509		**Credits**	:	0
Hours/Week(L:T:P)	:	0:0:2		**CIE**	:	100 Marks
Total Hours	:	12 L		**SEE**	:	-
Course Type	:	NCMC		**SEE Duration**	:	-

Course Learning Objectives: This course will enable the students to	
CLO1	Describe patanjali's ashtanga yoga and its role in holistic well-being.
CLO2	Perform the suryanamaskar sequence with correct breathing and posture.
CLO3	Identify different types of asanas with their techniques and benefits.
CLO4	Utilize the knowledge of kapalabhati with proper technique and safety measures.
CLO5	Apply pranayama techniques to enhance physical and mental health.

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

Course Outcomes: After completing the course,the students will be able to	
CO1	Summarize patanjali'sashtanga Yoga and its significance in promoting daily well-being.
CO2	Demonstrate suryanamaskar with correct sequence, breathing and posture alignment.

CO3	Classify various types of asanas with their benefits and precautions.
CO4	Utilize the knowledge to practice kapalabhati with correct technique, breathing rhythm and safety guidelines.
CO5	Apply pranayama to improve overall physical fitness and mental wellness.

Text Book	
1	Light on Yoga, B. K. S. Iyengar, Revised/Latest Available Edition, HarperCollins Publishers India, 2017, ISBN: 978-8172235017.

Reference Books	
1	Teaching Methods for Yogic Practices, Dr. M. L. Gharote and Dr. S. K. Ganguly, 4th Edition, Kaivalyadhama Publishers, Lonavla, 2009, ISBN: 9788189485245.
2	Yoga Instructor Course Handbook, Faculty of Yoga Sciences, S-VYASA University, Latest Revised Edition, S-VYASA Publications, Bengaluru.
3	Yogapravesha (Kannada), Ajit Kumar, Latest Available Edition, Prasaranga Publications/Regional Publisher.
4	Yoga for Children: Step by Step, YaminiMuthanna, Latest Available Edition, Sapna Book House/Regional Publisher, Bengaluru.

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/playlist?list=PLzF4lOyPf_Z9yQ_Gphjh1wZ5fEhMg6hmP
2	https://www.youtube.com/playlist?list=PLOzRYVm0a65cCcY4qKX5MIyJxBt7hJgQY
3	https://youtu.be/KB-TYlgd1wE
4	https://youtu.be/aa-TG0Wg1Ls

CO – PO MAPPING

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

Semester:V					
Music					
Course Code	**:**	BMU509	**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:0:2	**CIE**	**:**	100 Marks
Total Hours	**:**	26 L	**SEE**	**:**	-
Course Type	**:**	NCMC	**SEE Duration**	**:**	-

Course Objectives: This course will enable the students to	
1	Applythe fundamental concepts of Indian classical music, including Shruthi, Nada, Swara, Laya, Raga, Tala, and Mela systems.
2	Interpretmajor Carnatic compositions such as Geethe, Jathiswara, Swarajathi, Varna, Krithi, and Thillana, including basic notation.
3	Describe the contributions of Purandaradasa, Thyagaraja, and Mysore Vasudevacharya to Indian classical music.
4	Classify traditional Indian musical instruments into string, wind, percussion, and idiophone categories with examples
5	Demonstratebasic vocal skills through SaraleVarase exercises, SuladiSaptaTala notations, and selected Carnatic compositions

Module -I	**03 Hrs**
Preamble: Contents of the curriculum intended to promote music as language to develop an analytical, creative and intuitive understanding. For this the student must experience music through study and direct participation in improvisation and composition. **Origin of the Indian Music:** Evolution of the Indian music system, understanding of Shruthi, Nada, Swara, Laya, Raga, Tala, Mela **Text Book 1**: V-1 Ch. 1-4	
Module–II	**03 Hrs**
Compositions: Introduction to the types of compositions in Carnatic Music–Geethe, JathiSwara, Swarajathi, Varna, Krithi and Thillana. Introduction to the notation system. **Text Book 2**: Ch. 4-7	
Module –III	**03 Hrs**
Composers: Biography and contributions of Purandaradasa, Thyagaraja, Mysoroasudevacharya, Kanakadasa **Text Book 3:**Ch. 2-5	
Module–IV	**03 Hrs**
Music Instruments: Classification and construction of string instruments, wind instruments, percussionInstruments, Idiophones (Ghana Vaadya), Examples of each class of instruments. **Text Book 1:** V-4 – Ch. 2-6	
Module –V	**14 Hrs**
AbhyasaGana: Singing the swara exercises (SaraleVarase Only), Botatio writing for saralevarase and sulafisaptatala (Only in mayamalavagowla raga), singing 4 geethe in malahari and one jathiswara, oekrithi in a mela raga **Text Book 1**:V-1&2	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply fundamental concepts of Indian classical music, including Shruthi, Nada, Swara, Laya, Raga, Tala, and Mela system
CO2	Identify and interpret basic Carnatic compositions using standard notation.

CO3	Summarize the contributions of composers.
CO4	Classify Indian musical instruments and describe their construction and use.
CO5	Demonstrate basic Carnatic vocal skills through selected exercises and compositions.

Text Books	
1	South Indian Music (Vol. I–VI), Prof. P. Sambamoorthy, 11th Edition (Reprint), The Indian Music Publishing House, Chennai, 2019.
2	A Textbook of Carnatic Music, Dr. S. Bhagyalekshmy, Latest Reprint Edition, CBH Publications, Thiruvananthapuram.
3	Karnataka Sangeetha Charitre, Dr. V. S. Sampath kumara charya, Latest Available Edition, Kannada University, Hampi.

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

CO – PO MAPPING

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

Institute Vision

Preparing Competent Engineering and Management Professionals to Serve the Society

Institute Mission

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

Department Vision

Building Competent Civil Engineers with a Societal Perspective

Department Mission

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

SJC INSTITUTE OF TECHNOLOGY

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