

www.sjcit.ac.in

||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

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

Core Values

Spiritual, Judicious, Commitment, Integrity, Trustworthy



AICTE | NATIONAL INSTITUTIONAL RANKING FRAMEWORK 151-300 | NBA | NAAC A+ | QS I-GAUGE GOLD | INSTITUTION'S INNOVATION COUNCIL (Ministry of HRD Initiative) 4-Star Rating

SJC INSTITUTE OF TECHNOLOGY, CHIKKABALLAPURA

An Autonomous institution Under VTU from 2024 – 2025

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

SCHEME OF TEACHING AND EXAMINATION – B.E.

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

7th 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	**BCV701**	Estimation and Contract Management	IPCC	Civil	3	0	2	**3**	**50**	**50**	**100**	**4**
2	**BCV702**	Design of Steel Structural Elements	IPCC	Civil	3	0	2	**3**	**50**	**50**	**100**	**4**
3	**BCV703**	Design of Prestressed Concrete Elements	PCC	Civil	3	2	0	**3**	**50**	**50**	**100**	**4**
4	**BCV724x**	Professional Elective Course – IV	PEC	Civil	3	0	0	**3**	**50**	**50**	**100**	**3**
5	**BCV745x**	Open Elective Course – II	OEC	Civil	3	0	0	**3**	**50**	**50**	**100**	**3**
6	**BCV736**	Major Project Phase – II	PROJ	Civil	0	0	12	**3**	**100**	**100**	**200**	**6**
7	**BCR737**	Career Readiness and Industry Integration	NCMC	CDCAC	0	2	0	-	**100**	-	**100**	**0**
									450	**350**	**800**	**24**

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 – IV

Course Code	Course Name	Course Code	Course Name
BCV724A	Pavement Design and Construction	**BCV724C**	Ground Improvement Techniques
BCV724B	Design of Bridges	**BCV724D**	Repair and Rehabilitation of Structures

Open Elective Course – II

Course Code	Course Name	Course Code	Course Name
BCV745A	Conservation of Natural Resources	**BCV745C**	Energy Efficiency, Acoustics and Day Lighting in Buildings
BCV745B	Intelligent Transport System	**BCV745D**	Sustainability and lifecycle Assessment

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.

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

Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

Project Work: The objective of the Project work is to:

i) Encourage independent learning and the innovative attitude of the students.

ii) Develop interactive attitude, communication skills, organization, time management, and presentation skills.

iii) Impart flexibility and adaptability.

iv) Inspire team working.

v) Expand intellectual capacity, credibility, judgment and intuition.

vi) Adhere to punctuality, setting and meeting deadlines.

vii) Install responsibilities to oneself and others.

viii) Train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

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.

SEE procedure for Project Work: SEE for project work will be conducted by the two examiners appointed by the University. The SEE 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.

SJC INSTITUTE OF TECHNOLOGY, CHIKKABALLAPURA

An Autonomous institution Under VTU from 2024 – 2025

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

SCHEME OF TEACHING AND EXAMINATION – B.E.

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

8th 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	**BCV821x**	Professional Elective Course - IV (Online Course) only through NPTEL / VTU MOOC / Centre of Excellence of the concerned department	PEC	**online**	3	0	0	**3**	**50**	**50**	**100**	**3**
2	**BCV842x**	Open Elective Course - III (Online Course) only through NPTEL / VTU MOOC / Centre of Excellence of the concerned department	OEC	**online**	3	0	0	**3**	**50**	**50**	**100**	**3**
3	**BCV833**	Internship (Industry / Research / Rural) (14 – 20 weeks)	INT	Ind	0	0	12	**3**	**100**	**100**	**200**	**8**
									200	**200**	**400**	**14**

PEC: Professional Elective Course, OEC: Open Elective Course, INT: Industry Internship / Research Internship, L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation.

Professional Elective Course – IV (Online Course – only through NPTEL, suggested by BoS)

Course Code	Course Name	Course Code	Course Name
BCV821A	Deep Excavation and Tunnels	**BCV821D**	Retrofitting and Rehabilitation of Civil Infrastructure
BCV821B	Project Management and Finance	**BCV821E**	Advanced Transportation Engineering
BCV821C	Advanced Design of RCC Structures	**BCV821F**	Urban Transportation Systems Planning

Open Elective Course – III (Online Course – only through NPTEL, suggested by BoS)

Course Code	Course Name	Course Code	Course Name

BCV842A	Energy Conservation in Buildings	**BCV842C**	Occupational Health and Safety
BCV842B	Integrated Building Services	**BCV842D**	Green Buildings

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

Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

Elucidation: At the beginning of IV years of the program i.e., after VI semester, VII semester classwork and VIII semester Research Internship /Industrial Internship / Rural Internship shall be permitted to be operated simultaneously by the University so that students have ample opportunity for an internship. In other words, a good percentage of the class shall attend VII semester classwork and a similar percentage of others shall attend to Research Internship or Industrial Internship or Rural Internship.

Research/Industrial /Rural Internship shall be carried out at an Industry, NGO, MSME, Innovation center, Incubation center, Start-up, center of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes.

The mandatory Research internship /Industry internship / Rural Internship is for 14 to 20 Weeks. The internship shall be considered as a head of passing and shall be considered for the award of a Degree. Those, who do not take up/complete the internship shall be declared to fail and shall have to complete it during the subsequent University examination after satisfying the internship requirements.

Research internship: A research internship is intended to offer the flavor of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research.

Industry internship: Is an extended period of work experience undertaken by students to supplement their Degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize, appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints.

Rural Internship: Rural development internship is an initiative of Unnat Bharat Abhiyan Cell, RGIT in association with AICTE to involve students of all departments studying in different academic years for exploring various opportunities in techno-social fields, to connect and work with Rural India for their upliftment.

Credit Definition

1-hour Lecture (L) per week=1Credit	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session
2-hoursTutorial(T) per week=1Credit	04-Credits (IC) are to be designed for 40 hours' theory and 12-14 hours of practical sessions
2-hours Practical / Drawing (P) per week=1Credit	03-Credits courses are to be designed for 40 hours of Teaching-Learning Session
2-hous Skill Development Actives (SDA) per week = 1 Credit	02- Credits courses are to be designed for 25 hours of Teaching-Learning Session
	01-Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions

Semester: VII						
Estimation and Contract Management **Stream : CV**						
Course Code	**:**	BCV701		**Credits**	**:**	04
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	Construction Project Management
Knowledge on Fundamental Concepts	Building Planning, Cross section ,Elevation
Knowledge on Connected Tools (If any)	M S Excel

Course Learning Objectives: This course will enable the students to	
CLO1	Apply the basic concepts related to estimating and costing in construction.
CLO2	Estimate the quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation works.
CLO3	Estimate key project resources such as labour, material, and plant and machinery (LMP) and carry out rate analysis.
CLO4	Apply the concept of Valuation for Properties.
CLO5	Prepare the Tender and Contract document.

Module – 1	**08 Hrs**
Quantity Estimation for Building: study of various drawing attached with estimates, important terms, units of measurements, abstract, Types of estimates. Estimation of building by short wall and long wall method - centre line method. **Text Book 1:** Ch 2 & 3 **Text Book 3:** Ch 1 to 4	
Module – 2	**08 Hrs**
Estimate of R.C.C Structures: Slab, beam, column, footings, Estimate of Steel truss, manhole and septic tanks and slab culvert. **Quantity Estimation for Roads:** Computation of volume of earthwork fully in banking, cutting, partly cutting and partly Filling by mid-section, trapezoidal and Prismoidal Methods. **Text Book 1:** Ch 4 to 7	
Module – 3	**08 Hrs**
Specification for Civil Engineering Works: Objective of writing specifications essentials in specifications, general and detail specifications of different items of works in buildings and roads. **Text Book 1:** Ch 13 **Text Book 3:** Ch 8	
Module – 4	**08 Hrs**
Rate Analysis: Schedule of Rates, Analysis of Rates, Factors Affecting Cost of Civil Works, Concept of Direct Cost, Indirect Cost and Project Cost Rate analysis and preparation of bills, Data analysis of rates for various items of Works, Sub-structure components, Rate analysis for R.C.C. slabs, columns and beams. **Text Book 1:** Ch 11 **Text Book 3:** Ch 9	
Module – 5	**08 Hrs**

Contract Management-Tender and its Process: Invitation to tender, Prequalification, administrative approval & Technical sanction. Bid submission and Evaluation process. Contract Formulation: Letter of intent, Award of contract, letter of acceptance and notice to proceed. Features / elements of standard Tender document (source: PWD / CPWD / International Competitive Bidding – NHAI / NHEPC / NPC). Law of Contract as per Indian Contract act 1872, Types of Contracts, Joint venture. Contract Forms: FIDIC contract Forms, CPWD, NHAI, NTPC, NHEPC

Basics of Value Engineering, Capitalised Value, Depreciation, Escalation, Calculation of Standard Rent, Land Valuation, Sinking fund, Mortgage, Lease-Valuation of Building, Loss Assessment

Text Book 1: Ch 15 & 16 **Text Book 2:** Ch 1 to 4 **Text Book 3:** Ch 17 & 22

	PRACTICAL COMPONENT OF IPCC **12 Lab Sessions**
1	Estimate the cost of building using M S Excel
2	Estimate the cost of RCC roof slab using M S Excel
3	Estimate the cost of septic tank using M S Excel
4	Estimate the cost of manhole using M S Excel
5	Estimate the cost of soak pit using M S Excel
6	Estimate the cost of earthwork in embankment and cutting for road works using M S Excel
7	Analyze the rates SSM work using M S Excel
8	Analyze the rates BBM work using M S Excel
9	Analyze the rates Cement Concrete (1:3:6 & 1:2:4) using M S Excel
10	Analyze the rates plastering inside and outside using M S Excel

Course Outcomes: After completing the course, the students will be able to	
CO1	Calculate quantities, estimated costs, and abstracts for various civil engineering works.
CO2	Estimate quantities of items involved in building, water supply, sanitary, road, and irrigation work
CO3	Analyze specifications and rates for various construction work item
CO4	Evaluate contract, tender, and valuation documents for construction projects
CO5	Develop Excel-based cost estimates for various civil engineering works.

Text Books	
1	Estimating and Costing, Datta B.N., UBSPD Publishing House, New Delhi.ISBN:10: 8174767312
2	Civil Engineering Contracts and Estimates, B.S. Patil, Universities Press. ISBN: 9788173719578
3	A Text Book of Estimating, Costing and Accounts Civil), Kohli, D. D. and Kohli, R. C. (2013). S. Chand & Company Ltd. ISBN-10: 8121903327

Reference Books	
1	Construction Cost Estimating. Routledge. Holm, L. and Schaufelberger, J. E. (2021). ISBN-9780367902681.
2	Estimating and Tendering for Construction Work. Brook, M. (2016).Routledge
3	PWD Data Book, CPWD Schedule of Rates (SoR). and NH SoR – Karnataka FIDIC Contract forms.

Web links and Video Lectures (e – Resources)	
1	https://youtu.be/ofkpm4lhJcg
2	https://youtu.be/GGikveOcaJw

CO – PO MAPPING

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

Semester: VII						
Design of Steel Structural Elements **Stream : CV**						
Course Code	**:**	BCV702		**Credits**	**:**	04
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	Structural Analysis, Design Concepts of RCC Members
Knowledge on Fundamental Concepts	Limit State Concepts
Knowledge on Connected Tools (If any)	Excel, AUTO CAD

Course Learning Objectives: This course will enable the students	
CLO1	Apply the provisions of IS 800:2007 for the design of steel members subjected to various loads.
CLO2	Design bolted and welded connections for steel structures.
CLO3	Analyze compression members using simple and built-up sections.
CLO4	Analyze tension members using simple and built-up sections.
CLO5	Design laterally restrained and unrestrained flexural members.

Module – 1	**08 Hrs**
Introduction: Advantages and Disadvantages of Steel Structures, Limit state method Limit State of Strength, Structural Stability, Serviceability Limit states, Failure Criteria of steel, Design Consideration, Loading and load combinations, IS code provisions, Specification and Section classification. **Plastic Behavior of Structural Steel:** Introduction, Plastic theory, Plastic Hinge Concept, Plastic collapse load, load factor, Shape factor, Theorem of plastic collapse, Methods of Plastic analysis. **Text Book 1:** Ch. 1,2,3 & 8 **Text Book 2:** Ch. 1, 2 & 5	
Module – 2	**08 Hrs**
Bolted Connections: Introduction, Types of Bolts, Behavior of bolted joints, Design of High Strength friction Grip (HSFG) bolts, Design of Simple bolted Connections (Lap and Butt joints).Design of roof truss using bolted connection. **Text Book 1:** Ch. 5 **Text Book 2:** Ch .12	
Module – 3	**08 Hrs**
Welded Connections: Introduction, Types and properties of welds, Effective areas of welds, Weld Defects, Simple welded joints for truss member. Advantages and Disadvantages of Bolted and Welded Connections. Design of roof truss using welded connection. **Text Book 1:** Ch. 6 **Text Book 2:** Ch. 12	
Module – 4	**08 Hrs**
Design of Tension Members: Introduction, Types of Tension members, Slenderness ratio, Modes of Failure, Factors affecting the strength of tension members, Design of Tension members with Lug angles. Design of Column Bases: Design of Simple Slab Base and Gusseted Base. **Text Book 1:** Ch. 3 **Text Book 2:** Ch.1 & 2	
Module – 5	**08 Hrs**
Design of Compression Members: Introduction, Failure modes, Behavior of compression members, Sections used for compression members, Effective length of compression members, Design of compression members and built-up Compression members, Design of Laced and Battened Systems. **Text Book 1:** Ch. 8 **Text Book 2:** Ch. 4	

	PRACTICAL COMPONENT OF IPCC	12 Lab Sessions
1	Design a Bolted Connections using M S Excel	
2	Design a welded Connections using M S Excel	
3	Design of Tension members using M S Excel	
4	Design of Compression Members using MS Excel	
5	Design of Simple Slab Base using M S excel	
6	Design of Gusseted Base using M S Excel	
7	Create AutoCAD drawings of column bases and gusseted bases with bolted and welded connections.	
8	Develop AutoCAD drawings of welded and bolted roof truss systems.	
9	Prepare AutoCAD drawings of beam-to-beam and beam-to-column connections using bolted and welded connections.	
10	Draft AutoCAD drawings of built-up columns with lacings and battens.	
11	Design and draw gantry girder details using AutoCAD for the given data.	
12	Prepare AutoCAD drawings of welded plate girders based on the given design data	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the fundamental principles, code provisions, material behavior, and safety criteria in steel structure design
CO2	Analyze bolted and welded connections in steel structures.
CO3	Evaluate compression members with and without built-up sections.
CO4	Evaluate tension members with and without built-up sections
CO5	Design steel connections and members under various loading conditions using Excel and prepare detailing using AutoCAD.

Text Books	
1	Design of Steel Structures, N Subramanian, Oxford University Press, New Delhi, India.ISBN-9780199460915
2	Limit State Design in Structural Steel, Shiyekar, M.R., PHI, 2013. ISBN: 9788120341043

Reference Books	
1	Limit State Design of Steel Structures S K Duggal, McGraw Hill Publications Chennai.ISBN: 9789353164874
2	IS 800 - 2007, Code of Practice for General Construction in Steel, Bureau of Indian Standards, New Delhi.

Web links and Video Lectures (e – Resources)	
1	**Design of Steel Structures IIT,Kharagpur:** https://nptel.ac.in/courses/105105162
2	**Design of Steel Structural Elements :** **https://www.youtube.com/watch?v=3T2JkrV_7O8&list=PLq46p_ppqQel5n9D4BwHqzdFQ3DbcOph7**

CO – PO MAPPING

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

Semester: VII						
Design of Prestressed Concrete Elements **Stream : CV**						
Course Code	**:**	BCV703		**Credits**	**:**	4
Hours/Week(L:T:P)	**:**	3:2:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L+ 12 T		**SEE**	**:**	50 Marks
Course Type	**:**	PCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Materials of construction, Design of RCC structures
Knowledge on Fundamental Concepts	Limit state of design
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Apply the principles of Prestressing in concrete structures.
CLO2	Apply the design principles and procedures specified in IS 1343.
CLO3	Analyze flexural and shear design of prestressed concrete elements.
CLO4	Assess the concepts of stresses in end block.
CLO5	Design pre-stressed concrete pipes, tanks, beams or I-girder for bridge, one-way and two-way slabs & bridges.

Module – 1	**08 Hrs**
Introduction: Pre stressed concrete and Codal Provisions Historic development- general principles of Prestressing, Types of pre stressing, pre-tensioning and post tensioning, advantages and limitation of prestressed concrete, Materials for pre stressed concrete- high strength steel and concrete, properties, Stress-strain characteristics of high strength steel and concrete. Introduction to Pre-stressing systems – Pre –Tensioning, Devices – Post - Tensioning Devices - Anchorage Devices - Mechanical pre-stressing - Chemical Pre-stressing - Electrical Pre-stressing **Text Book 1:** Ch-1: 1.1 to 1.6, Ch-2: 2.1 to 2.2, Ch-3: 3.1 to 3.2	
Module – 2	**08 Hrs**
Basic Principles of Pre Stressing: Fundamentals of Prestressing, Stress concept, Strength concept, Load balancing concept, , Pretensioning and post tensioning methods-Analysis of post tensioning, Systems of pre stressing. **Analysis of Sections for Flexure:** Elastic analysis of pre stressed concrete beams with straight, parabolic, triangular, trapezoidal cable profiles, Eccentric and concentric pre stressing, Numerical problems. **Text Book 1:** Ch-3: 3.3 to 3.4, Ch-4: 4.1 to 4.7	
Module – 3	**08 Hrs**
Losses of Pre Stress: Loss of prestress due to elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage and frictional losses, Computation of Loss of Prestress for Pretensioned and Post Tensioned members, Numerical problems. **Deflection of Pre Stressed Concrete Beams:** Short term and long-term deflections, Elastic deflections due to different loads and cable profiles, Deflection limits as per IS:1343, Effect of creep on deflection, Load versus deflection curve, methods of reducing deflection, Numerical problems. **Text Book 1:** Ch-5: 5.1 to 5.8, Ch-6: 6.1 to 6.6	
Module – 4	**08 Hrs**

Limit state of Collapse: **Flexure:** IS code recommendations, Ultimate flexural strength of sections for pretensioned and post tensioned members with and without bonding, **Shear:** IS code recommendations on shear strength, Shear resistance of sections, shear reinforcement, Limit state of serviceability- Control of deflection and cracking, Numerical Problems**. Text Book 1:** Ch-7: 7.1 to 7.5, Ch-8: 8.1 to 8.3	
Module – 5	**08 Hrs**
Design of Beams: Concept of Stresses of end blocks, Limiting zone , Design of Anchorage zone – End block, Numerical Problems. **Applications of Pre-Stressing**: Introduction - Design concepts of Prestressed Concrete Pipes, Pre-stressing in Buildings (Beams – One-way Slabs – Two-way Slabs – Flat slabs). **Text Book 1:** Ch-9: 9.1 to 9.7, Ch-10: 10.2, 10.5, Ch-16: 16.1 to 16.3, Ch-17: 17.1 to 17.4,	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the basic concepts of prestressing in various Civil Engineering Structures.
CO2	Assess the various prestressing losses in prestressed concrete elements as per Indian Standard Codal provisions.
CO3	Analyze the prestressed concrete elements for deflection under various loading system.
CO4	Design the prestressed concrete elements for flexure and Shear and draught detailing.
CO5	Evaluate the Prestressed members for End zone stresses and design composite Prestressed structures.

Text Books	
1	Pre Stressed Concrete, N Krishna Raju, Tata McGraw Hill Publishers, 2018, ISBN-10 9387886204.

Reference Books	
1	Pre Stressed Concrete, P Dayarathnam, Oxford and IBH Publishing Co., 6th Edition, 2018, ISBN 8120417917.
2	Prestressed Concrete, Muthu K.U, Ibrahim Azmi, Janardhana Maganti, Vijayanand M, Prentice Hall India Learning Private Limited,2016, ISBN 9788120351691.
3	Design of Pre Stressed Concrete Structures, T Y Lin and Ned H Burns, John Wiley & Sons, New York,3rd Edition, 2010, ISBN 9788126528035.
4	IRC 112 and IS 1343 codes, Bureau of Indian Standards, New Delhi.

Web links and Video Lectures (e – Resources)	
1	**Basic Principles of Pre Stressed Concrete:** **https://www.youtube.com/watch?v=IazOBBQlzEw**
2	**Pre Tensioning VS Post Tensioning:** **https://www.youtube.com/watch?v=MIvfc6xScMo**
3.	**Applications of Pre-Stressing**: https://www.youtube.com/watch?v=_ZQh1J2tZA0

CO – PO MAPPING

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

Semester: VII					
Pavement Design and Construction **Stream : CV**					
Course Code	:	BCV724A	**Credits**	:	03
Hours/Week(L:T:P:S)	:	3:0:0	**CIE**	:	50 Marks
Total Hours	:	40 L	**SEE**	:	50 Marks
Course Type	:	PEC	**SEE Duration**	:	3 Hours

Prerequisites	
Courses	Building materials, Transportation Engineering
Knowledge on Fundamental Concepts	Principles of Soil Mechanics and Geotechnical Engineering
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students	
CLO1	Apply the properties, specifications, and testing procedures of pavement construction materials.
CLO2	Apply the principles and design methodologies of flexible and rigid pavement
CLO3	Analyze the stresses and design requirements of rigid pavements as per standard codes.
CLO4	Examine the highway construction equipment and planning techniques used in road projects.
CLO5	Evaluate pavement construction practices, quality control measures, and pavement performance.

Module – 1	**08 Hrs**
Pavement Materials: Desirable properties, requirements and tests of pavement materials such as soil subgrade, aggregates, bituminous binders, bituminous paving mix, cement and concrete **Text Book 1:** Ch. 6 **Text Book 2:** Ch. 18, 19, 20	
Module – 2	**08 Hrs**
Pavement Design: Introduction: Desirable characteristics of pavement, Types, components of pavement & its functions, Difference between Highway pavement and Air field pavement, comparison between Rigid and flexible pavement. **Flexible Pavement:** Factors governing design, design of flexible pavements as per IRC: 37:2018, IIT Pave Software, Case study - Design Problems. **Text Book 1:** Ch. 7 **Text Book 2:** Ch. 16	
Module – 3	**08 Hrs**
Stresses in Rigid Pavement: Types of stress, Analysis of Stresses, Westergaard's Analysis, Modified Westergaard equations, Critical stresses, Wheel load stresses, Warping stress, Frictional stress, combined stresses (using chart / equations), problems on above. **Design of Rigid Pavement**: Design of CC pavement as per IRC: 58-2015, Requirements of joints, Types of joints, Reinforcement in slabs, Design of Dowel bars, Design of Tie bars, problems of the above **Text Book 1:** Ch. 7 **Text Book 2:** Ch. 22	
Module – 4	**08 Hrs**
Highway Construction Equipments: Plants and Machinery: Introduction; Asphalt Hot Mix Plant, Concrete Batching Plant, Wet Mix Macadam Plant, Earthmoving and Excavation Equipment, Paving Equipment, Slip form Paver, Paver Milling and Road Marking Equipment;	

Factors affecting output of Plant & Equipment; Initiatives to improve quality.

Construction Planning: Concept of Highway Planning; Schedules in Planning; Monitoring; Software in Planning.

Text Book 3: Ch. 3, 4, 5

Module – 5	**08 Hrs**

Highway Construction and Pavement Evaluation: Subgrade and Base Layer: Construction practices and quality control for granular sub-base and cement-treated sub-base layers.

Flexible layers: Construction practices and quality control for Wet Mix Macadam and Hot Mix Asphalt.

Rigid layers: Construction practices and quality control for Dry Lean Concrete and Pavement Quality Concrete.

Pavement Evaluation: Introduction, Pavement Condition Survey, Pavement Evaluation Functional and Structural, Distresses - Flexible and Rigid Pavement, Overlay Design of Flexible Pavement.

Text Book 1: Ch. 8, 10 **Text Book 2:** Ch. 27, 29

Course Outcomes: After completing the course, the students will be able to	
CO1	Evaluate the suitability of pavement materials and performance for construction, maintenance, and overlay design using standard tests.
CO2	Design of flexible and rigid pavements using IRC guidelines.
CO3	Analyze the stresses in rigid pavements.
CO4	Apply knowledge of construction equipment and planning tools to optimize highway project execution and quality.
CO5	Assess construction practices and quality parameters for various pavement layers in highway construction.

Text Books	
1	Highway Engineering, S K Khanna, CEG Justo and A. Veeraragavan, 10th Edition, Nem Chand and Bros Publishers, ISBN-10 : 8185240930
2	Principles and Practices of Highway Engineering, Kadiyali L.R and Dr. Lal N.B., Khanna Publishers, New Delhi, 2003, ISBN: 9788193328439
3	Construction Equipment and its Management, S C Sharma, Khanna Publishers, ISBN-10 : 9382609059
4	Principles of Transportation Engineering, Partha Chakraborty, PHI Learning Publishers, ISBN: 8120353459

Reference Books	
1	Transportation Engineering, C. Jotin Khisty, B.Kent Lall PHI Learning Pvt. Ltd 3rd Edition, 2016, ISBN, 9332587647,
2	Road Materials & Pavement Design. E.J. Yoder, M.W.Witczak Wiley India Pvt Ltd; 2nd edition,2011, ISBN: 9780471977803 5
3	Introduction to Transportation Engineering, James H Banks McGraw. Hill Publications 2010. ISBN-10: 0072431881
4	Specifications for Roads and Bridges MORTH Specifications, IRC Indian Road Congress Publications 2013.
5	IRC Codes IRC Indian Road Congress Publications, Periodical edition.
6	Advanced Transport Management System. Dr MILAN JANIC, Publisher : Springer

	Nature; 14th edition (21 January 2014); Springer Nature. ISBN-13. 978-1447162865
7	Pavement Design and Materials, A. T. Papagiannakis and E. A. Masad John Wiley & Sons 2008, ISBN:9780471214618
8	Advanced Traveller and Information System, Bob McQueen Publisher : Artech House Publishers; Unabridged edition 31 August 2002, ISBN-13 : 978-1580531337

Web links and Video Lectures (e – Resources)	
1	**Pavement Materials:** **https://www.youtube.com/watch?v=sQ63_AvwGFY&list=PLLy_2iUCG87CHFdFEAVGc2iISoF9DD554**
2	**Pavement Design: https://www.youtube.com/watch?v=3regRDxFk-M**
3	**Highway Construction and Pavement Evaluation:** **https://www.youtube.com/watch?v=inCSL6N7jmM&list=PLwdnzlV3ogoVBR8BPfFZVVtPqEtJFs0S2**

CO – PO MAPPING

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

Semester: VII						
Design of Bridges **Stream : CV**						
Course Code	:	BCV724B		**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	Structural Analysis and Design, Fluid Mechanics / Hydraulics
Knowledge on Fundamental Concepts	Basic understanding of mechanics of materials, structural behavior, and load calculations, concepts of fluid flow, discharge, and open channel hydraulics.
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students	
CLO1	Identify bridge classifications, site selection and hydraulic parameters like discharge and scour.
CLO2	Explain IRC loading standards and load distribution theory.
CLO3	Design slab and skew slab bridges under IRC loads.
CLO4	Analyze T-beam bridge components for design applications
CLO5	Design box culverts based on structural and detailing requirements

Module – 1	**08 Hrs**
Introduction to Bridges: History, classification, ideal site selection, computation of discharge, linear waterway, economic span, afflux, scour depth Design loads for bridges, introduction to I.R.C. loading standards, Load Distribution Theory, Bridge slabs, Effective width, Introduction to methods as per I.R.C. **Text Book 1:** Ch 1,2,3,5 **Text Book 2:** Ch 1,2,3,5,9	
Module – 2	**08 Hrs**
Design of Slab Bridges: Straight and skew slab bridges as per IRC class A, B, AA tracked and wheeled vehicles. **Text Book 2:** Ch 10, 11 **Text Book 3:** Ch 4	
Module – 3	**08 Hrs**
Design of T Beam Bridges: Proportioning of components, analysis of slab using IRC Class AA tracked vehicle, structural design of slab, analysis of cross girder for dead load & IRC Class A, B, AA tracked and wheeled vehicle, structural design of cross girder, analysis of main girder using Courbon's method, calculation of dead load BM and SF, calculation of live load BM & SF using IRC Class A, B, AA tracked and wheeled vehicle. Structural design of main girder. **Text Book 3:** Ch 5 **Text Book 4:** Ch 9, 10	
Module – 4	**08 Hrs**
Introduction to Box Culvert: Analysis for maximum BM and SF at critical sections using moment distribution method for various load combinations such as Dead, Surcharge, Soil, Water and Live load as per IRC class A, B, AA tracked and wheeled vehicles. Structural design	

of box culvert using limit state method with reinforcement details. **Text Book 3:** Ch 6 **Text Book 4:** Ch 11	
Module – 5	**08 Hrs**
Substructures : Design of Piers and abutments, Introduction to Bridge bearings, Hinges and Expansion joints. (No design) **Text Book 5:** Ch 12, 14 **Text Book 1:** Ch 7, 8	

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze bridge types, site conditions, and hydrological parameters for bridge planning and design.
CO2	Apply IRC loading standards and load distribution methods in the design of bridge decks
CO3	Design slab and skew slab bridges under IRC loading conditions
CO4	Design T-beam bridge components using Courbon's method and IRC loads.
CO5	Design box culverts for multiple load cases using the Limit State Method (LSM).

Text Books	
1	Bridge Engineering, S. P. Bindra, 9th Edition, 2013, Dhanpat Rai Publications, ISBN: 9788177000592
2	Essentials of Bridge Engineering, D. Johnson Victor, 6th Edition, 2007, Oxford & IBH Publishing, ISBN: 9788120417179
3	Bridge Engineering, Rangwala, 36th Edition, 2020, Charotar Publishing House, ISBN: 9789385039272
4	Bridge Engineering, N. Krishna Raju, 1st Edition, 1998, CBS Publishers, ISBN: 9788123907530
5	Design of Concrete Bridges, M. G. Aswani, 1st Edition, 1993, Wiley Eastern Ltd., ISBN: 9788122405709

Reference Books	
1	IRC Codes: IRC:6, IRC:21, IRC:112, IRC:70, and IRC:83, Bureau of Indian Standards, New Delhi.
2	Concrete Bridge Design, R. T. Allen & S. C. Edwards, 2nd Edition, 1999, Thomas Telford, ISBN: 9780727727738
3	Bridge Deck Behaviour, E. C. Hambly, 2nd Edition, 1991, Taylor & Francis, ISBN: 9780415279491

Web links and Video Lectures (e – Resources)	
1	**Introduction to Bridge Engineering:** **https://www.youtube.com/watch?v=TNxyVjD3OfA&list=PLiYAH68F-CTDflYKk5Rdb8MSlFSNyVaMo**
2	**Design of Slab Bridges:** **https://www.youtube.com/watch?v=U4a0q4hYUWw&list=PLYX9X4ZldqpYMaPURxSbY1i8vgfVsZfmQ**
3	**Design of RCC T Beam Bridge:** **https://www.youtube.com/watch?v=TDuvNevZwp0&list=PLjn5wOg33E_GOApp0n0yy2pVUz-iK_qI2**

CO – PO MAPPING

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

Semester: VII						
Ground Improvement Techniques **Stream : CV**						
Course Code	:	BCV724C		**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	Geotechnical Engineering
Knowledge on Fundamental Concepts	Soil Characteristics. Soil Types
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Apply the fundamental concepts of ground improvement techniques
CLO2	Apply principles of mathematics, science, and geotechnical engineering to solve ground modification problems in civil engineering.
CLO3	Analyze the mechanisms and applications of chemical compaction, grouting, and other ground improvement methods
CLO4	Analyze the functions and applications of geosynthetics, vibration techniques, grouting, and injection methods in ground improvement.
CLO5	Apply ground improvement techniques such as geosynthetics, soil reinforcement, anchors, rock bolts, and soil nailing in the design of earth-retaining structures.

Module – 1	**08 Hrs**
Formation and Development of Ground: Introduction, Formation of Rock, soil and soil profile, Soil distribution in India, Alterations of ground after formation, Reclaimed soils, Natural offshore deposits; Ground Improvement Potential – Hazardous ground conditions, poor ground conditions, favourable ground conditions, Alternative Approaches, Geotechnical processes. Compaction: Introduction, compaction mechanics, Field procedure, surface compaction, Dynamic Compaction, selection of field compaction procedures, compaction quality control. **Text Book 1:** Ch 1.1-1.6, Ch.2.1 -2.6	
Module – 2	**08 Hrs**
Drainage Methods: Introduction, Seepage, filter requirements, ground water and seepage control, methods of dewatering systems, Design of dewatering system including pipe line effects of dewatering. Drains, different types of drains. Pre-compression and Vertical Drains: Importance, Vertical drains, Sand drains, Drainage of slopes, Electro kinetic dewatering, Preloading. **Text Book 1:** Ch 3.1-3.8, Ch.4.1 -4.5	
Module – 3	**08 Hrs**
Chemical Modification: Chemical Modification-I Definition, cement stabilization, sandwich technique, admixtures. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage and strength and deformation characteristics. Criteria for cement stabilization. Stabilization using Fly ash. Chemical Modification-II: Lime stabilization – suitability, process, criteria for lime stabilization. Other chemicals like chlorides, hydroxides, lignin and hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.	

Text Book 1: Ch 7.1 – 7.6	
Module – 4	**08 Hrs**
Vibration Methods: Introduction, Vibro compaction – blasting, vibratory probe, Vibro displacement compaction – displacement piles, vibro flotation, sand compaction piles, stone columns, heavy tamping Grouting And Injection: Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure, Applications of grouting. **Text Book 1:** Ch. 5.1-5.3	
Module – 5	**08 Hrs**
Geosynthetics: Introduction, Geosynthetic types, properties of Geosynthetics – materials and fibre properties, Geometrical aspects, mechanical properties, Hydraulic properties, Durability; Applications of Geosynthetics - Separation, Filtration and Fluid Transmission, Reinforcement, Miscellaneous Methods (Only Concepts & Uses): Soil reinforcement, Thermal methods, Ground improvement by confinement – Crib walls, Gabions and Mattresses, Anchors, Rock bolts and soil nailing. Stone Column, Micro piles. **Text Book 1:** Ch.8.1- 8.4	

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze problematic soil conditions and select appropriate compaction techniques for ground improvement.
CO2	Design drainage and dewatering systems, including drains, for civil engineering applications.
CO3	Analyse the suitability of physical and chemical admixtures such as cement, fly ash, and lime for ground improvement.
CO4	Apply appropriate ground improvement techniques to specific geotechnical engineering problem.
CO5	Design earth-retaining structures using ground improvement techniques such as geosynthetics, soil reinforcement, anchors, rock bolts, and soil nailing.

Text Books	
1	Ground Improvement Techniques, Dr Purushotam raj, Lakshmi Publications.1999, ISBN: 81-7008-837-2.

Reference Books	
1	Fundamentals of Ground Improvement Engineering, Jeffrey Evans), Daniel Ruffing , David Elton,CRC Press,2021, ISBN-13 :978-1000411393.
2	Ground Improvement Techniques, Joyanta Maity, Bikash Chandra Chattopadhyay, PHI Learning,2017 ISBN-13:978-812035320.
3	Ground Improvement Techniques, Nihar Ranjan Patra, Vikas Publishing Hous,2012,ISBN-109789325960015.

Web links and Video Lectures (e – Resources)	
1	**Need for Ground Improvement:** https://www.youtube.com/watch?v=6yhW3CbArQc
2	**Ground Improvement Techniques: Vertical Drains:** **https://www.youtube.com/watch?v=iT0uFDLww7U**
3	**Classification Of Ground Modification Techniques:** https://www.youtube.com/watch?v=56uqge3-OAs

CO – PO MAPPING

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

Semester: VII						
Repair and Rehabilitation of Structures **Stream : CV**						
Course Code	**:**	BCV724D		**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	Building materials, DRCC, Concrete technology
Knowledge on Fundamental Concepts	Construction materials, design concepts
Knowledge on Connected Tools (If any)	NDT equipment

Course Learning Objectives: This course will enable the students to	
CLO1	Analyze the condition of existing structures using appropriate assessment techniques.
CLO2	Analyze the deterioration mechanisms of construction materials and their effects on structural performance.
CLO3	Analyze structural and non-structural cracks and their implications on structural behavior and serviceability.
CLO4	Apply the selection criteria for repair materials in structural rehabilitation.
CLO5	Apply rehabilitation strategies to enhance the safety and service life of deteriorated structures.

Module – 1	**08 Hrs**
Introduction: Causes of distress in concrete structures- Permeability of concrete, aggressive chemical agents, durability aspects, Holistic models for deterioration of concrete. Condition Survey, Preliminary inspection, planning stage, visual inspection, field laboratory testing stage, consideration for repair strategy. **Text Book 1:** Ch.1	
Module – 2	**08 Hrs**
Influence on Serviceability and Durability: Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and cathodic protection. **Text Book 1:** Ch.2, Ch.3	
Module – 3	**08 Hrs**
Non Destructive and Destructive Testing Methods: Non-Destructive evaluation tests - Concrete strength assessment - Rebound hammer test - Ultrasonic pulse velocity tests, penetration resistance, pull out tests, core sampling and testing, Chemical tests - Carbonation tests and chloride content, Corrosion potential assessment, half-cell potentiometer test, resistivity measurement, Identification and estimation of damage. **Text Book 1:** Ch.4, Ch.5	
Module – 4	**08 Hrs**
Materials for Repair: Materials for Repair - Special concretes and mortar - Concrete chemicals – Artificial fiber reinforced polymer like CFRP, GFRP, AFRP and natural fiber like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain. **Techniques for Repair:** Techniques for Repair - Rust eliminators and polymers coatings for	

rebars during repair – Foamed concrete - Mortar and dry pack - Vacuum concrete - Gunite and shotcrete - Epoxy injection – Mortar repair for cracks - Shoring and underpinning. **Text Book 1:** Ch.7, Ch.8, Ch.9

Module – 5	**08 Hrs**
Retrofitting of R.C Buildings: Introduction; Considerations in retrofitting of structures; Source of weakness in RC frame Building, Classification of retrofitting techniques; retrofitting strategies for RC buildings. Example of Repairs to Structures - Repairs to overcome low member strength – Deflection – Cracking - Chemical disruption - Weathering wear - Fire leakage – Marine Exposure. **Text Book 1:** Ch.10, Ch.11	

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze the causes and mechanisms of deterioration in concrete structures.
CO2	Apply durability principles to predict the performance of concrete under different exposure condition.
CO3	Analyze NDT results to diagnose the type and extent of structural deterioration.
CO4	Evaluate repair materials and select appropriate repair options for deteriorated structures.
CO5	Design repair and rehabilitation schemes for civil infrastructure systems.

Text Books	
1	Rehabilitation of Concrete Structures , B Vidivelli, Standard Publishers Distributors; 1st edition (1 January 2009), New Delhi, ISBN-13 : 978-8180141102

Reference Books	
1	Handbook on Repair and Rehabilitation of RCC Buildings, Published by CPWD, Delhi, 2002
2	Rehabilitation of Concrete Structures, Vidivelli, B, Standard Publishers Distributors, New Delhi, 2008. ISBN:8180141020
3	Maintenance, Repair & Rehabilitation And Minor Works of Buildings, Varghese P.C., 1st Edition, PHI Learning Private Ltd., New Delhi., 2014.ISBN 13: 978-8120349452

Web links and Video Lectures (e – Resources)	
1	**Influence on Serviceability and Durability:** https://www.youtube.com/watch?v=wOJ7f1ZeshA
2	**Non Destructive and Destructive Testing Methods: https://www.youtube.com/watch?v=5cNWF61Tmj0&list=PLyAZSyX8Qy5AePdV6vbGP4OJQOpbga-0Q**
3	**Retrofitting of R.C Buildings: https://www.youtube.com/watch?v=taa4Fq-fERQ&list=PLq46p_ppqQemCi6i4SvZ1kCpFREHQkF__**

CO – PO MAPPING

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

Semester: VII						
Conservation of Natural Resources **Stream : CV**						
Course Code	**:**	BCV745A		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	OEC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Environmental Science
Knowledge on Fundamental Concepts	Ecological concepts, Natural ecosystems, Human-environment interactions
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Analyze the sustainable use, management of land, water, forest and energy, mineral, marine, and food resources.
CLO2	Classify natural resources based on their characteristics and interrelationships.
CLO3	Analyze global resource conflicts and the role of international cooperation in managing shared resources.
CLO4	Examine ecological, economic, and ethnological approaches to resource management.
CLO5	Apply ecological, economic, and social principles in evaluating resource utilization and conservation practices

Module – 1	**08 Hrs**
Introduction to Natural Resource Bases: Concept of resource, classification of natural resources. Factors influencing resource availability, distribution and uses. Inter relationships among different types of natural resources. Concept of common property. Ecological, social and economic dimension of resource management. Impact of natural resources depletion on environment and development. **Text Book 1:** Ch 1: 1.1 – 1.3	
Module – 2	**08Hrs**
Land Resources: types of lands, conservation of landforms, deforestation, effect of land use changes. Soil health, ecological and economic importance of soil, impact of soil degradation on agriculture and food security, need for soil conservation, sustainable land use planning. **Food Resources:** World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. **Mineral Resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies. **Text Book 1:** Ch 5: 5.1 – 5.2, Ch 2: 2.1 – 2.3	
Module – 3	**08 Hrs**
Water Resources: Use and overutilization of surface and ground water, drought, conflicts over water, dams-benefits and problems. Water ecology and management. **Fish and Other Marine Resources:** Production, status, dependence on fish resource, unsustainable harvesting, issues and challenges for resource supply, new prospects. **Text Book 1:** Ch 4: 4.1 – 4.3	
Module – 4	**08Hrs**
Forest Resources: Forest vegetation, status and distribution, contribution as resource. Use and overexploitation, deforestation. Timber extraction, mining, dams and their effects on forest	

and tribal people, Forest products. Developing and developed world strategies for forestry.
Energy Resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
Text Book 1: Ch 6: 6.1 – 6.2, Ch 2: 2.2

Module – 5	**08 Hrs**

Approaches in Resource Management: Ecological approach; economic approach; ethnological approach; implications of the approaches; integrated resource management strategies. Poverty and implications in resource management in developing countries – poverty in developing countries, causes and link with resources scarcity and poverty. Resource conflicts: Resource extraction, access and control system. Management of Common International Resources: Ocean, climate.
Text Book 1: Ch 1: 1.3

Course Outcomes: After completing the course, the students will be able to	
CO1	Classify natural resources based on their characteristics, availability, and patterns of utilization.
CO2	Analyze the environmental consequences of unsustainable practices in agriculture, mining, forestry, and energy utilization.
CO3	Analyze the ecological, social, and economic impacts of natural resource depletion and land-use changes.
CO4	Evaluate the significance of soil, water, forest, and marine resources for sustainable development
CO5	Apply integrated approaches for natural resource management, with a focus on poverty reduction and equitable access.

Text Books	
1	Ecology of Natural Resources. Francois Ramade, John Wiley & Sons Ltd,1984, ISBN 13: 9780471901044

Reference Books	
1	Global Change and Natural Resource Management, Vitousek, P.M. 1994. Beyond global warming: Ecology and global change. Ecology 75, 1861-1876.
2	Fundamentals of Ecology. Odum, E.P. 1971. W.B. Saunders Co. USA, 574p ISBN-10, 0721669417
3	Managing Natural Resources - Focus on Land and Water. Harikesh N Mishra 2014 PHI Lerning Publication. ISBN : 9788120349339
4	Ecology, Environment and Resource Conservation, Singh J.S, Singh S.P & Gupta, S.R., Anamaya publications, 2006. ISBN: 978-0815341383

Web links and Video Lectures (e – Resources)	
1	**Introduction to Natural Resource Bases:** https://www.youtube.com/watch?v=or-z0Q03pcY
2	**Approaches in Resource Management:** **https://www.youtube.com/watch?v=9wXoxt34Gro**
3	**Resource Management Paradigms:** **https://www.youtube.com/watch?v=kZ6sOi7NTXw**

CO – PO MAPPING

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

Semester: VII						
Intelligent Transport System **Stream : CV**						
Course Code	**:**	BCV745B		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	OEC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Transportation Engineering
Knowledge on Fundamental Concepts	Fundamental concepts, transportation engineers work to design and manage systems that are efficient, safe, environmentally friendly, and sustainable.
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Analyze the fundamental concepts and components of Intelligent Transportation Systems (ITS).
CLO2	Analyze ITS architecture, technologies, and hardware components.
CLO3	Apply advanced transport management systems and traffic control strategies.
CLO4	Analyze advanced traveler information systems and methods of data dissemination.
CL05	Analyze global ITS implementations and case studies in developed and developing countries.

Module – 1	**08 Hrs**
Introduction to Intelligent Transport System: Introduction to Intelligent Transportation Systems(ITS)-Definition–Role and Responsibilities – Advanced Traveller Information System – Fleet Oriented ITS Services –Electronic Toll Collection – Critical issues – Security – Safety. **Text Book 1:** Ch:1	
Module – 2	**08 Hrs**
ITS Architecture and Hardware: Architecture – ITS Architecture Framework – Hardware Sensors – Vehicle Detection – Techniques – Dynamic Message Sign – GPRS – GPS – Toll Collection. **Text Book 1:** Ch:3	
Module – 3	**08 Hrs**
Advanced Transport Management System: Video Detection – Virtual Loop - Cameras - ANPR – IR Lighting – Integrated Traffic Management – Control Centre – Junction Management Strategies- ATMS – Advanced Traveler Information Systems (ATIS)- Route Guidance – Issues - Historical – Current – Predictive Guidance – Data Collection – Analysis – Dynamic Traffic Assignment (DTA) – Components –Algorithm. **Text Book 1:** Ch:6	
Module – 4	**08 Hrs**
Advanced Traveller and Information System: Travel Information – Pre Trip and Enroute Methods- Basic ATIS Concepts – Smart Route System – Data Collection – Process –	

Dissemination to Travelers – Evaluation of Information – Value of Information – Business Opportunities. **Text Book 1:** Ch:9	
Module – 5	**08 Hrs**
Case Studies: Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries. **Text Book 2:** Ch:20	

Course Outcomes: After completing the course, the students will be able to	
CO1	Describe the basic concepts, roles, and services of ITS.
CO2	Analyze the architecture and functioning of ITS hardware and sensor technologies.
CO3	Apply ITS-based traffic management techniques, including data analysis and dynamic traffic assignment.
CO4	Evaluate advanced traveler information systems and data dissemination processes.
CO5	Compare ITS implementation in various global contexts and propose suitable models for developing countries.

Text Books	
1	Intelligent Transport Systems, Pradip Kumar Sarkar & Amit Kumar Jain Publisher: PHI Learning, Publication, 2018 ISBN: 9789387472068,
2	Highway Engineering, L R Kadiyali, Khanna Publishers, New Delhi. 2005. ISBN-9788174091659

Reference Books	
1	Transportation Engineering, C. Jotin Khisty, B.Kent Lall PHI Learning Pvt. Ltd 3rd Edition 2002. ISBN-13: 978-0130335609
2	Road Materials & Pavement Design, E.J. Yoder, M.W.Witczak Wiley India Pvt Ltd; 2nd edition 2011. ISBN-13, 978-8126530724
3	Introduction to Transportation Engineering, James H Banks McGraw. Hill Publications 2010. ISBN-10. 0072431881
4	Specifications for Roads and Bridges MORTH Specifications, IRC Indian Road Congress Publications 2013. ISBN:9788193293201
5	IRC Codes IRC Indian Road Congress Publications, Periodical edition. ISBN-10. 9386593009
6	Advanced Transport Management System, Dr MILAN JANIC, Publisher : Springer Nature; 14th edition (21 January 2014); Springer Nature. ISBN-13. 978-1447162865
7	Pavement Design and Materials, A. T. Papagiannakis and E. A. Masad John Wiley & Sons 2008. ISBN:9780470259924
8	Advanced Traveller and Information System, Bob McQueen Publisher : Artech House Publishers; Unabridged edition (31 August 2002), ISBN-13 : 978-1580531337

Reference Books	
1	**Introduction to Intelligent Transport System:** https://www.youtube.com/watch?v=o2wTi4d2P6o
2	**Advanced Transport Management System:** https://www.youtube.com/watch?v=P26dLrx2xZk

CO – PO MAPPING

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

Semester: VII						
Energy Efficiency, Acoustics and Day Lighting in Buildings **Stream : CV**						
Course Code	**:**	BCV745C		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	OEC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basic courses in Building Science, Environmental Engineering, and Thermodynamics.
Knowledge on Fundamental Concepts	Heat transfer, solar geometry and basic environmental science.
Knowledge on Connected Tools (If any)	Web tools like ECONIWAS and solar rooftop calculators.

Course Learning Objectives: This course will enable the students to	
CLO1	Analyze the influence of climatology, heat ingress, and energy flow on building performance.
CLO2	Apply design parameters related to lighting, acoustics, and indoor air quality in buildings.
CLO3	Analyze energy-efficient building design solutions and resource management strategies.
CLO4	Analyze environmental impacts and sustainable management practices associated with building.
CLO5	Apply energy-saving technologies and web-based tools for estimating energy savings in buildings.

Module – 1	**08 Hrs**
Introduction to Climatology and Heat Ingress in Building: Basics of climatology, Earth – Sun relationship, Solar angles and sun path diagram, Design of shading systems. Basics of Thermodynamics, Convection/radiation heat transfer, Heat gain through various elements of a building, Thermal comfort models and case studies. **Text Book 1:** Ch 1, 2	
Module – 2	**08 Hrs**
Building Acoustics, Indoor Air Quality and Lighting in Buildings: Basics of sound and Building acoustics – Acoustic defects, prevention of sound transmission and acoustic measure for office building. Indoor Air Quality – Effects, control of contaminants and moisture in indoor environment, Integrated approach for IAQ management. Fundamentals of lighting- Day lighting and its metrics – Strategies for day lighting and its control. Artificial lighting – Design and control strategies – Visual comfort enhancement. **Text Book 2:** Ch 5, 6	
Module – 3	**08 Hrs**
Energy Efficient Buildings, Water 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, Energy simulation, Energy management system – Renewable energy and Energy Audit. (demand control ventilation) Water Efficiency – Planning	

and design of water management system, Rain water harvesting, Water efficient design and fixtures, Treatment and reuse 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.

Text Book 1: Ch 6, 7 **Text Book 4:** Ch 8

Module – 4	**08 Hrs**

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 – Modelling and Analysis, Greenhouse gas emission. Different phases of Green building project management.

Text Book 2: Ch 8, 9

Module – 5	**08 Hrs**

Energy Efficient Rating: Energy efficiency rating for distribution transformers, diesel generator set, motors, pumps, electrical appliances, lighting fixtures and lifts as per Bureau of Energy Efficiency (BEE). Energy efficiency in HVAC system – Variable Frequency Drive (VFD), Air volume drive. Roof top solar installations and solar water heaters, Heat recovery system in buildings, Building Management System (BMS) – Occupancy sensors and energy efficient lighting controls, Smart Buildings.

Text Book 5: Ch 10, 12

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze Earth-Sun relationships and analyze heat transfer through building elements.
CO2	Apply design parameters for lighting, acoustics, and indoor air quality in buildings.
CO3	Design energy-efficient building solutions and resource management strategies.
CO4	Analyze environmental impacts associated with buildings and sustainable management practices.
CO5	Evaluate energy-saving technologies and estimate energy savings using web-based tools.

Text Books	
1	Energy Efficient Buildings: Basics and Applications, Akshay B. Sawant, 1st edition, 2018, McGraw Hill Education, ISBN: 978-0070680983
2	Sustainable Building Design: Principles and Practice, Miles Keeping, Andrej A. Krzeminski, 1st Edition, 2018, Routledge, ISBN: 978-1138300867
3	Handbook of Sustainable Building Design and Construction, Ugur Pasaoglu, 1st Edition, 2017, CRC Press, ISBN: 978-1498749122
4	Energy Management and Conservation Handbook, Frank Kreith, D. Yogi Goswami, CRC Press, ISBN: 978-1439812907

Reference Books	
1	Green Building and Sustainable Design: Energy Efficiency and Indoor Environmental Quality, Sam Kubba, 2nd Edition, 2013, Butterworth-Heinemann, ISBN: 978-0123851284
2	Thermal Comfort, P.O. Fanger, 1st Edition, McGraw-Hill Education, ISBN: 978-0070286009
3	Environmental Control Systems: Heating, Cooling, Lighting, F. P. Schmidt, Wiley-Blackwell, ISBN: 978-0471238387

Web links and Video Lectures (e – Resources)	
1	**Introduction to Climatology and Heat Ingress in Building:** **https://www.youtube.com/watch?v=kxoRtG3WHEE**
2	**Energy Efficiency, Acoustics and Daylighting in Building:** https://onlinecourses.nptel.ac.in/noc24_ce47/preview

CO – PO MAPPING

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

Semester: VII						
Sustainability and Lifecycle Assessment **Stream : CV**						
Course Code	**:**	BCV745D		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	OEC		**SEE Duration**	**:**	3 Hours

Prerequisites:	**Environmental Science**
Courses	Engineering Basics
Knowledge on Fundamental Concepts	Ecology, Ecosystem, Chemistry and Physics
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Analyze sustainability principles and their relevance to engineering systems and societal development
CLO2	Apply sustainable materials, technologies, and circular economy concepts in engineering applications..
CLO3	Analyze Life Cycle Assessment methodologies and ISO standards for environmental evaluation.
CLO4	Apply LCA tools to assess the environmental performance of products and processes.
CLO5	Analyze sustainability assessment tools, ESG reporting frameworks, and green building standards for informed decision-making

Module – 1	**08 Hrs**
Introduction to Sustainability in Civil Engineering: Definition and principles of sustainability, Three Pillars of sustainability: Environmental, Economic, and Social, Sustainable development goals (SDGs) and engineer's role, Challenges in achieving sustainability in engineering systems, Principles of sustainable engineering and systems thinking. **Text Book 1:** Ch 1: 1.1 – 1.4, Ch 2: 2.1 – 2.4	
Module – 2	**08 Hrs**
Sustainable Practices in Engineering: Resource efficiency, waste minimization, and circular economy, Sustainable materials and energy use in engineering, Case studies from civil, mechanical, electrical, and software engineering, Green technologies and eco-innovation, Introduction to sustainability indicators and metrics**.** **Text Book 1:** Ch 6: 6.1 – 6.7.	
Module – 3	**08Hrs**
Life Cycle Thinking and Fundamentals of LCA: Life Cycle Thinking: cradle-to-grave and cradle-to-cradle concepts, Life Cycle Assessment: purpose, scope, and key stages, Overview of ISO 14040 and 14044 standards, Functional unit, system boundary, data inventory, Introduction to LCA software and tools (e.g., OpenLCA, SimaPro) **Text Book 1:** Ch 3: 3.1 – 3.3	
Module – 4	**08Hrs**
Applications of LCA in Engineering: LCA in product design and development, Comparative LCA of alternative products/processes, Environmental impacts: carbon footprint, water footprint, energy use, Case studies from various engineering sectors, Interpreting and communicating LCA results for decision-making. **Text Book 1:** Ch 4: 4.4	
Module – 5	**08 Hrs**

Sustainability Assessment Tools and Policies: Environmental Product Declarations (EPDs), National and international sustainability standards and frameworks (e.g., GRIHA, LEED, BREEAM), Corporate sustainability reporting and ESG (Environmental, Social, Governance), Green procurement and sustainable supply chain, Policy instruments and the role of engineers in sustainability transitions. **Text Book 1:** Ch 8: 8.1-8.8

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze sustainability principles, Sustainable Development Goals (SDGs) and systems thinking in engineering applications.
CO2	Apply sustainable engineering practices involving resource efficiency, waste minimization, circular economy and green technologies.
CO3	Analyze Life Cycle Assessment (LCA) methodologies, standards, and tools for evaluating engineering systems.
CO4	Evaluate the environmental impacts of products, processes, and engineering alternatives using Life Cycle Assessment techniques.
CO5	Evaluate sustainability assessment frameworks, reporting systems, green building standards, and policy instruments for sustainable decision-making.

Text Books	
1	The Theory and Practice of Sustainable Engineering, Allenby, Braden R, Pearson college, 2011,ISBN 13 : 978-0132127998

Reference Books	
1	Fundamentals of Air Pollution and Sustainability, Daniel Vallero, Academic Press. ISBN: 9780124017337.
2	Sustainability Engineering: Concepts, Design and Case studies, Prentice Hall, 1s Edn, 2015. ISBN 13: 9780131103627.
3	ISO 14040 and ISO 14044 **–** Environmental Management – Life Cycle Assessment Standards.Beareu of Indian Standards.2006.
4	Life Cycle Assessment: Theory and Practice, Michael Hauschild, Ralph K. Rosenbaum, Stig Irving Olsen**,** Springer. ISBN: 9783319564746.

Web links and Video Lectures (e – Resources)	
1	**LCA and Sustainability:** https://www.youtube.com/watch?v=VNgtajZVAKE&list=PL3MO67NH2XxL8WmVnN3j2wX8v5THwi0sw
2	**Life Cycle Assessment (LCA) For Beginners:** https://www.youtube.com/watch?v=2s8wqa_lvoQ
3	**Sustainability Assessment Tools**: https://youtu.be/KIz6DLCafuE?si=y-zsjoOFlsCfVs8Z

CO – PO MAPPING

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

Semester: VII						
Major Project Phase – II **Stream : CV**						
Course Code	**:**	BCV736		**Credits**	**:**	6
Hours/Week(L:T:P)	**:**	0:0:12		**CIE**	**:**	100 Marks
Total Hours	**:**	--		**SEE**	**:**	100 Marks
Course Type	**:**	--		**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: VII						
Career Readiness and Industry Integration						
Course Code	:	BCR737		**Credits**	:	0
Hours/Week(L:T:P)	:	0:2:0		**CIE**	:	100 Marks
Total Hours	:	30 L		**SEE**	:	-
Course Type	:	NCMC		**SEE Duration**	:	-

Prerequisites:	
Courses	Competency Enhancement Course-1,2,3&4
Knowledge on Fundamental Concepts	-
Knowledge on Connected Tools	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Strengthen core aptitude and reasoning skills.
CLO2	Build confidence and competence for interviews and group activities.
CLO3	Develop foundational and advanced problem-solving using Data Structures and Algorithms (DSA).
CLO4	Enable algorithmic thinking through pseudocode.
CLO5	Apply clean coding practices in high-pressure environments.

Module – 1	**12 Hrs**
Company-Specific Aptitude Practice: Solve previous year question papers from major campus recruiters. These detailed solutions help candidates familiarize themselves with the patterns, difficulty levels, and frequently asked question types of leading companies. **Text Book 1:** Ch1-7, **Text Book 2:** Ch1-5	
Module – 2	**12 Hrs**
Group Discussion Mastery: Revisiting key principles of effective GDs, Abstract, current affairs, and case-based topics, Role of initiator, moderator, and conclusion leads, Multiple GD rounds with evaluation rubrics, How to stand out without dominating **Resume Writing and Linked Profiling:** Effective resume writing involves a clear, results-focused format tailored to the job, highlighting key skills and quantified achievements. A strong LinkedIn profile complements this by showcasing your professional story, skills, endorsements, and active engagement to boost visibility and credibility. **Interview Skills:** Quick recap of HR & Technical Interview structures, Smart resume revision techniques Rebuilding your personal pitch for 2025 placements, Mock Q&A: Handling common & tricky questions, Feedback loops for voice tone, articulation & clarity **Mock Interviews (Technical + HR) Practice Rounds:** Individual interview rounds in real-time simulation, Panel-style questioning and cross-questioning, Focused feedback on confidence, grooming, and articulation, Personalized correction pointers for improvement **Text Book 3: Page-1-112**	
Module-3	**12 Hrs**
Importance of Competitive Coding for Interviews and Placements: Problem decomposition & edge case identification, Basics of time and space complexity, Story-based introduction to problem-solving, Brainstorm real-world scenarios & translate to problems, Identify edge cases via mini-quizzes, Live walkthroughs (e.g., parking fee calculator), **Coding Warm-up Challenge:** Arrays, Linked Lists, Stacks, Queues, Hashing, Trees, Graphs, Mapping DS to real-life systems (e.g., ticket booking, social feeds), Trade-offs in DS selection, Implement DS in hands-on coding labs, Real-life simulation: Airline or hospital queue system,	

Use case discussions, Group exercises with efficiency comparisons, Greedy, Divide & Conquer, DP, Backtracking, Practical applications with real-world stories, Efficiency and trade-offs, Debugging complex logic, Group challenge: Route optimization using Dijkstra, Hands-on: Knapsack, Fibonacci DP, Game simulations, Compare multiple approaches for the same problem, Debugging hackathons **Reference Book 1:**Ch1-12	
Module-4	**12 Hrs**
Importance of Pseudocode in Problem-solving and Interview Preparation: Structure and syntax of pseudocode (input/output, conditionals, loops), Translating problem statements into structured pseudocode, Converting pseudocode to actual code (dry run), Common logical mistakes in pseudocode, Aligning pseudocode with data structure & algorithm design, Write pseudocode for classic problems (e.g., factorial, palindrome, searching/sorting), Group activity: Convert real-world scenarios into pseudocode (e.g., ATM simulation, elevator logic), Peer reviews and correction of pseudocode, Dry-run pseudocode vs actual code, Challenge: Write pseudocode for unseen story-based problems **Reference Book 2:** Ch1-5	
Module-5	**12 Hrs**
Real-time Coding Practice Under Pressure: Clean code and edge case handling, Explaining solutions during interviews, Final review of optimization strategies, Mock interviews with peer & trainer feedback, Solve end-to-end coding case studies, Debugging marathons, Individual reflection + feedback loop **Reference Book 3:** Ch1-6	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply foundational aptitude concepts to solve quantitative, verbal and logical reasoning problems with accuracy and efficiency.
CO2	Demonstrate professional communication skills and interview readiness through mock interviews, personal pitch delivery and group discussions.
CO3	Solve coding problems using appropriate data structures and algorithms, recognizing edge cases and optimizing for time/space complexity.
CO4	Interpret real-world problems into structured pseudocode and implement clean, logical solutions in code.
CO5	Perform under interview-like coding conditions, explain approaches and apply debugging techniques to deliver optimal solutions.

Text Books	
1	Quantitative Aptitude for Competitive Examinations, R.S. Aggarwal Chand Publishing. – 2023.
2	Objective English, S.P. Bakshi, 3rd Edition, Arihant Publications – 2021, ISBN- 978-9325791718.
3	Cracking the Code to a Successful Interview, Evan Pellett, Blackstone Pub- 2016, ISBN- 978-1441700537.

Reference Books	
1	Data Structures and Algorithms, Narasimha Karumanchi, 5th Edition, Career monk Publications.2016, ISBN- 978-8193245279.
2	Algorithm Design Manual, Steven Skiena, 1st Edition, springer np exclusive(cbs). 2017, ISBN- 978-1849967204.
3	Cracking the Coding Interview, Gayle Laakmann McDowell, 6th Edition, CareerCup. 2015, ISBN- 978-0984782857.

Web links and Video Lectures (e – Resources)	
1	https://www.placementpreparation.io/quantitative-aptitude/
2	https://www.examsnet.com/quantitative-aptitude
3	https://www.testmocks.com/blog/reasoning-mock-test/
4	https://www.practice4me.com/verbal-ability-test/
5	https://codersdaily.in/start/verbal-aptitude-test
6	https://grow.google/certificates/interview-warmup/
7	https://course.flourish.careers/interview-essentials-toolkit
8	https://gdpiwat.com/gd-concepts/
9	https://timespro.com/online-courses/certificate-program-in-professional-grooming-and-workplace-behaviour
10	https://www.edstellar.com/course/grooming-etiquette-training
11	https://www.hackerrank.com/
12	https://www.codechef.com/practice
13	https://codeforces.com/blog/entry/23054
14	https://algocademy.com/blog/how-to-write-pseudocode-that-impresses-interviewers/
15	https://algocademy.com/blog/how-to-use-pseudocode-effectively-in-technical-interviews-a-comprehensive-guide/
16	https://codeforces.com/
17	https://leetcode.com/

CO – PO MAPPING

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

Semester: VIII						
Internship (Industry / Research / Rural)						
Course Code	**:**	BCV833		**Credits**	**:**	8
Hours/Week (L: T: P)	**:**	0: 0: 12		**CIE**	**:**	100 Marks
Total Hours	**:**	14 to 20 Weeks		**SEE**	**:**	100 Marks
Course Type	**:**	INT		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	• **Basic Engineering Sciences**: Engineering Mechanics, Strength of Materials • **Core Civil Engineering**: Fluid Mechanics, Geotechnical Engineering, Structural Analysis, Surveying, Concrete Technology, Environmental Engineering, Transportation Engineering • **Project/Design Courses**: Construction Technology, Design of RC Structures, Hydraulics and Irrigation.
Knowledge on Fundamental Concepts	• Fundamentals of structural, geotechnical, water resources, and environmental engineering • Design principles and safety considerations in construction • Basic understanding of research methodology and technical writing • Awareness of sustainability, community needs, and rural development • Professional ethics and project documentation
Knowledge on Connected Tools (If any)	• **Industry Internship:** AutoCAD, STAAD.Pro, Primavera/MS Project, Total Station, MS Excel • **Research Internship:** MATLAB, Ansys, Plaxis, Origin, SPSS, Lab testing instruments • **Rural Internship:** QGIS, Excel, Google Forms, mobile-based survey tools, basic AutoCAD.

Course Learning Objectives: This course will enable the students to	
CLO1	Apply core civil engineering knowledge in real-world engineering environments.
CLO2	Analyze and solve field-level or research-oriented civil engineering problems.
CLO3	Use modern tools and practices relevant to the internship domain.
CLO4	Demonstrate effective communication, ethics, and teamwork in a professional setting.
CLO5	Prepare technical reports and present outcomes related to internship work.

Elucidation: At the beginning of IV years of the program i.e., after VI semester, VII semester classwork and VIII semester Research Internship /Industrial Internship / Rural Internship shall be permitted to be operated simultaneously by the University so that students have ample opportunity for an internship. In other words, a good percentage of the class shall attend VII semester classwork and a similar percentage of others shall attend to Research Internship or Industrial Internship or Rural Internship. **Research/Industrial /Rural Internship** shall be carried out at an Industry, NGO, MSME, Innovation center, Incubation center, Start-up, center of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes. **The Mandatory Research Internship /Industry Internship / Rural**	**12Hrs/ Week**

Internship is for 14 to 20 Weeks. The internship shall be considered as a head of passing and shall be considered for the award of a Degree. Those, who do not take up/complete the internship shall be declared to fail and shall have to complete it during the subsequent University examination after satisfying the internship requirements. **Research internship:** A research internship is intended to offer the flavor of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research. **Industry Internship:** Extended period of work experience undertaken by students to supplement their Degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize, appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints. **Rural Internship:** Rural development internship is an initiative of Unnat Bharat Abhiyan Cell, RGIT in association with AICTE to involve students of all departments studying in different academic years for exploring various opportunities in techno-social fields, to connect and work with Rural India for their upliftment.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply civil engineering principles, standard procedures, tools, software, and methodologies to perform domain-specific tasks in the internship environment.
CO2	Analyze engineering problems encountered during internship activities by integrating theoretical knowledge with practical observations and field data
CO3	Evaluate engineering practices, project outcomes, and professional decisions while demonstrating ethical responsibility, teamwork, and adherence to industry standards.
CO4	Develop strategies and practices that promote ethical behavior, professional excellence, and effective teamwork in engineering projects.
CO5	Develop and present comprehensive technical documentation, reports, and presentations that propose solutions and effectively communicate project work and findings.

CO – PO MAPPING

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

Institute Vision

Preparing Competent Engineering and Management Professionals to Serve the Society

Institute Mission

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

Department Vision

Building Competent Civil Engineers with a Societal Perspective

Department Mission

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

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

P.B. No.20, B.B Road,

Chikkaballapur - 562 101, Karnataka