



S J P N Trust's

Hirasugar Institute of Technology, Nidasoshi.

Inculcating Values, Promoting Prosperity

Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi

Recognized under 2(f) & 12B of UGC Act, 1956

Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE

Civil Engg. Dept

Academic
Course Plan

2023-24 (Odd)

Rev: 00

INSTITUTE VISION

“To be a preferred institution in Engineering Education by achieving excellence in teaching and research and to remain as a source of pride for its commitment to holistic development of individual and society”

INSTITUTE MISSION

“To continuously strive for the overall development of students by educating them in a state-of-the-art- infrastructure, by retaining the best practices, faculties and inspire them to imbibe real-time problem-solving skills, leadership qualities, human values and societal commitments, so that they emerge as competent professionals”.

DEPARTMENT VISION


"To be the centre of excellence in providing education in the field of Civil Engineering to produce technically competent and socially responsible engineering graduates."

DEPARTMENT MISSION

"Educating students to prepare them for professional competencies in the broader areas of the Civil Engineering field by inculcating analytical skills, research abilities and encouraging culture of continuous learning for solving real time problems using modern tools."

PROGRAM EDUCATIONAL OBJECTIVES (PEO's):

- 1. Pursue a successful career in various domains of Civil Engineering Profession by acquiring knowledge in mathematical, scientific and engineering fundamentals.*
- 2. Analyze and design Civil Engineering systems with social awareness and responsibility.*
- 3. Exhibit professionalism, ethical approach, communication skills & teamwork in their profession and adapt to modern trends by engaging in lifelong learning.*

	S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i>	Civil Engg. Dept
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi Recognized under 2(f) & 12B of UGC Act, 1956	Academic Course Plan
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	2023-24 (Odd)
		Rev: 00


PROGRAM OUTCOMES (PO's):

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO's):


PSO1: *Inculcating in students practical knowledge and experimental skills to tackle Civil Engineering problems using technical and management skills, exhibiting professional ethics to meet the societal needs.*

PSO2: *Provide solutions related to Civil Engineering built environment through a multidisciplinary approach.*

	S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi Recognized under 2(f) & 12B of UGC Act, 1956 Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	Civil Engg. Dept
		Academic Course Plan
		2023-24 (Odd)
		Rev: 00


CONTENTS

Sl. No.	TOPIC	PAGE No.
01	Student Help Desk	IV
02	Departmental Resources	V
03	Teaching Faculty Details	V
04	Institute Academic Calendar	VI
05	Scheme of Teaching and Examination IV Semester	VII
Theory – Course Plans and Question Bank		
01.	Design of Pre-stressed Concrete	18CV81 01-05
02.	Rehabilitation & Retrofitting	18CV824 06-10

	S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi Recognized under 2(f) & 12B of UGC Act, 1956 Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	Civil Engg. Dept Academic Course Plan 2023-24 (Odd) Rev: 00
--	--	---

1.0 Student Help Desk

Sl. No.	Purpose	Contact Person	
		Faculty	Instructor
01	HOD, Academics, Attestations, Exam forms signature	Prof. S.M.Chandrakanth	NA
02	Research Center Co-Ordinator,	Prof. S.M.Chandrakanth	NA
03	Industry-Institute-Interaction, Technical Magazine Coordinator (MoU, Ind. Visit etc.)	Prof. Shreedevi S B	NA
04	EMS / ED Cell coordinator, TP Cell officer	Prof. Preethi. R.Patil	NA
05	Project Coordinator, KSCST, IEEE coordinator, Smart India Hackathon, Scholarship, LIC	Prof. Preethi. R.Patil	NA
06	FACE / Website Coordinator	Prof. Sudarshan V Jore	NA
07	Civil/ IT Maintenance, Feedback / Publicity, Department News Letter, NSS, Student Welfare	Prof. Vishwanath I Patil	NA
08	GATE Coaching Coordinator	Prof. Sudarshan V Jore	NA
09	ISTE / E-Shikshana / E-learning / Internship	Prof. Vishwanath I Patil	NA
10	Women Empower cell, Conference, FDP, Workshop	Prof. Shreedevi S B	NA
11	IA Coordinator / Alumni coordinator	Prof. Shreedevi S B	NA
Institute Level			
		Faculty	Contact
12	Student Welfare Convener	Sri. M. G. Huddar	8217056798
13	TP Cell Coordinator	Sri. Pramod. Patil	9731104059
14	Anti-Ragging Committee Member	Sri. K.M.Akkoli	9739114856
15	Anti Raging Squad Convener	Sri. K.M.Akkoli	9739114856
16	Internal Complaint Committee Convener	Smt. S. S. Kamte	9008696825
17	Grievance redressal Convener	Sri. S. S. Tabhaj	9901398134
18	Sports and Cultural / Extra-Curricular Activities Convener	Sri. S.B. Sarawadi	9739109383

	S J P N Trust's Hirasugar Institute of Technology, Nidasoshi. <i>Inculcating Values, Promoting Prosperity</i> Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi Recognized under 2(f) & 12B of UGC Act, 1956 Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE	Civil Engg. Dept Academic Course Plan 2023-24 (Odd) Rev: 00
--	--	---

2.0 Departmental Resources

Department of Civil Engineering was established in the year 2020 and is housed in a total area of 858 Sq. Mtrs.

2.1 Faculty Position

Sl.No.	Category	No. in Position	Average experience (in years)
01.	Teaching faculty	05	13
02.	Technical Supporting Staff	00	00
03.	Helper staff	02	21

2.2 Major Laboratories

Sl.No.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested (Rs. in Lakhs)
01.	Computer Aided Building Planning & Drawing	66	14.37
02.	Building Materials Testing Laboratory	149	11.02
03.	Geology Laboratory	76	0.75
04.	Fluid Mechanics & Hydraulic Machines Laboratory	72	7.76
05	Surveying Practice	76	0.70
06	Concrete and Highway Materials Laboratory	72	1.30
07	Geotechnical Engineering Laboratory	73	0.70
08	Environmental Engineering Laboratory	200	New Setup Under Process

Total Investment in the Department

Rs. 36.60 Lakhs

3.0 Teaching Faculty Details

Sl. No.	Name	Designation	Qualification	Specialization	Professional Membership	Teaching Exp (In yrs.)	Phone No.
01	Prof. S.M.Chandrakanth	Asst. Prof./HOD	M. Tech. (PhD)	Highway Engineering	IAENG 220815	12	8867814854
02	Prof. Preethi R. Patil	Asst. Prof.	M. Tech.	Structures	--	04	9606557280
03	Prof. Vishwanath I Patil	Asst. Prof.	M. Tech	Structures	--	05	9975499979
04	Prof. Sudarshan V Jore	Asst. Prof.	M. Tech.	CT & M	--	02	9535459918
05	Prof. Shreedevi S B	Asst. Prof.	M. Tech.	CT & M	--	02	7760429556



S J P N Trust's

Hirasugar Institute of Technology, Nidasoshi.

Inculcating Values, Promoting Prosperity

Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi

Recognized under 2(f) & 12B of UGC Act, 1956

Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE

Civil Engg. Dept

Academic
Course Plan

2023-24 (Odd)

Rev: 00

4.0 Institute Academic Calendar

	S J P N Trust's	IQAC
	Hirasugar Institute of Technology, Nidasoshi.	File I-11
	Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi Recognized under 2(f) & 12B of UGC Act, 1956	AY:2023-24 (Even)
	Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA:CSE & ECE	Rev: 01

ACADEMIC CALENDAR OF EVENTS-01 (CoE-01) OF VIII & II SEMs FOR THE AY: 2023-24

Ref: 1) VTU CoE Draft Notification No.: VTU/BGM/AC/2023-24/5699, Dated 16th June 2024
2) VTU CoE Notification No.: VTU/BOS/AC/2023-24 (EVEN)/6251, Dated 12th Feb. 2024

Calendar	Date	Events & Holidays
	12 th Feb. 2024	Commencement of VIII Semester Classes
	4 th March 2024	National Safety Day
	6 th March 2024	Commencement of II Semester Classes & Induction Programme ((Phase-2)
	8 th March 2024	International Women's Day
	8 th March 2024	GH: Maha-Shivaratri
	12 th March 2024	NAAC Cycle-02 SSR Submission
	13 th March 2024	No Smoking Day
	15 th -16 th March 2024	1 st IA Test for VIII Sem & Science Day
	16 th March 2024	1 st Feedback on Teaching-Learning (VIII Sem.)
	21 st March 2024	Display of 1 st IA Test Marks of VIII Sem
	22 nd March 2024	World Water Day
	29 th March 2024	GH: Good Friday
	2 nd April 2024	Technovision-24
	9 th April 2024	GH: Yugadi Festival
	11 th April 2024	GH: Kutub-A-Ramjan
	12 th -13 th April 2024	2 nd IA Test for VIII Sem
	13 th April 2024	2 nd Feedback on Teaching-Learning (VIII Sem.)
	15 th -17 th April 2024	1 st IA Test for II Sem
	17 th April 2024	1 st Feedback on Teaching-Learning (II Sem.)
	17 th April 2024	Display of 2 nd IA Test Marks of VIII Sem
	22 nd April 2024	Display of 1 st IA Test Marks of II Sem
	1 st May 2024	GH: Labours Day
	3 rd -4 th May 2024	Fun Week-HSIT Shambhrama-24 & Graduation day-24
	8 th May 2024	World Red Cross Day
	8 th May 2024	3 rd IA Test for VIII Sem
	9 th May 2024	Final Year Project Exhibition
	11 th May 2024	Display of 3 rd IA Test Marks of VIII Sem
	10 th May 2024	GH: Basav Jayanti/Akhsay Trutiya
	11 th May 2024	Last Working Day of the VIII Semester Classes
	13 th -21 st May 2024	VIII Sems. VTU Theory Exams
	17 th -18 th May 2024	Lab IA Test-I (II Sem. 2022 Scheme)
	20 th -22 nd May 2024	2 nd IA Test for II Sem
	22 nd May 2024	2 nd Feedback on Teaching-Learning (II Sem.)
	27 th May 2024	Display of 2 nd IA Test Marks of II Sem
	17 th -19 th June 2024	3 rd IA Test for II Sem
	21 st -22 nd June 2024	Lab IA Test-II (II Sem. 2022 Scheme)
	22 nd June 2024	Display of 3 rd IA Test Marks of II Sem
	29 th June 2024	Last Working Day of the II Semester Classes
	1 st -11 th July 2024	VTU II Sem Practical Examinations
	15 th July-10 th Aug. 2024	VTU II Sem Theory Examinations

February -2024						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29		

March -2024						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
31					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

April -2024						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

May-2024						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

June-2024						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
30						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

Dr.S.N.Topannavar
IQAC Coordinator & Dean (Academics)

Nidasoshi, Taq: Hukkeri, Dist: Belgaum - 591 236
Phone:+91-8333-278887, Fax:278886, Website:www.hsit.ac.in, Mail:principal@hsit.ac.in



Dr.S.C.Kahale
Principal

Page 1 of 2



S J P N Trust's

Hirasugar Institute of Technology, Nidasoshi.

Inculcating Values, Promoting Prosperity

Approved by AICTE, New Delhi, Permanently Affiliated to VTU, Belagavi

Recognized under 2(f) & 12B of UGC Act, 1956

Accredited at 'A' Grade by NAAC & Programmes Accredited by NBA: CSE & ECE

Civil Engg. Dept

**Academic
Course Plan**

2023-24 (Odd)

Rev: 00

5.0 Scheme of Teaching & Examination

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2018 – 19
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
(Effective from the academic year 2018 – 19)**

VIII Semester

B.E: Civil Engineering

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI Scheme of Teaching and Examination 2018 – 19 Outcome Based Education(OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2018 – 19)												
Programme: CIVIL ENGINEERING												
VIII SEMESTER												
Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours/Week			Examination				
					Theory Lecture	Tutorial	Practical/Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P					
1	PCC	18CV81	Design of Pre-stressed Concrete	Civil Engg.	3	--	--	03	40	60	100	3
2	PEC	18CV82X	Professional Elective - 4	Civil Engg.	3	--	--	03	40	60	100	3
3	Project	18CV83	Project Work Phase - 2	Civil Engg.	--	--	16	03	40	60	100	8
4	Seminar	18CV84	Technical Seminar	Civil Engg.	--	--	2	03	100	--	100	1
5	Internship	18CV85	Internship	Completed during the vacation/s of VI and VII semesters and /or VII and VIII semesters.)				03	40	60	100	3
TOTAL					06	--	18	15	260	240	500	18
Note: PCC: Professional Core, PEC: Professional Elective.												
Professional Electives - 4												
Course code under 18CV82X		Course Title										
18CV821		Bridge Engineering										
18CV822		Prefabricated Structures										
18CV823		Advanced Foundation Engineering										
18CV824		Rehabilitation & Retrofitting										
18CV825		Pavement Design										



Subject Title	Design of Pre Stressed concrete		
Subject Code	18CV81	CIE Marks	40
Number of Lecture Hrs / Week	(3:0:0)	SEE Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
CREDITS – 03			

FACULTY DETAILS:		
Name: Prof. Preethi R. Patil	Designation: Asst. Professor	Experience: 5 Years
No. of times course taught: 02	Specialization: Structural Engineer	

1.0 Prerequisite Subjects:

Sl.No	Branch	Semester	Subject
01	Civil Engineering	I	Elements of civil engineering
02	Civil Engineering	III	Strength of Materials
03	Civil Engineering	V	Design of RC structural elements
04	Civil Engineering	VI	Design of steel structures

2.0 Course Objectives

1. Provide basic knowledge in the areas of limit state method and concept of design of RC and steel structures
2. Identify , formulate and solve engineering problems in RC and steel structures
3. Provide factual knowledge on analysis and design of RC Structural elements, who can participate and succeed in competitive examinations.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to:

Sl.No	Course Outcome	RBT Level	POs
C419.1	Understand the requirement of PSC members for present scenario	L1,L2,L3,L4	1,2,3,5,6,8,12
C419.2	Analyse the stresses encountered in PSC element during transfer and at working.	L1,L2,L3,L4	1,2,3,5,6,8,12
C419.3	Understand the effectiveness of the design of PSC after studying losses	L1,L2,L3,L4	1,2,3,5,6,8,12
C419.4	Capable of analyzing the PSC element and finding its efficiency.	L1,L2,L3,L4	1,2,3,5,6,8,12



C419.5	Design PSC beam for different requirements.	L1,L2,L3,L4	1,2,3,5,6,8,12
Total Hours of instruction			40

4.0 Course Content

Module-1

Introduction and Analysis of Members: Concept of Pre stressing - Types of Pre stressing - Advantages - Limitations –Pre stressing systems - Anchoring devices - Materials - Mechanical Properties of high strength concrete - high strength steel - Stress-Strain curve for High strength concrete. Analysis of members at transfer - Stress concept - Comparison of behavior of reinforced concrete – pre stressed concrete - Force concept - Load balancing concept - Kern point -Pressure line.

Module-2

Losses in Pre stress: Loss of Pre stress due to Elastic shortening, Friction, Anchorage slip, Creep of concrete, Shrinkage of concrete and Relaxation of steel - Total Loss. Deflection and Crack Width Calculations of Deflection due to gravity loads - Deflection due to prestressing force -Total deflection - Limits of deflection - Limits of span-to-effective depth ratio -Calculation of Crack Width - Limits of crack width

Module-3

Design of Sections for Flexure: Analysis of members at ultimate strength - Preliminary Design - Final Design for Type I members.

Module-4

Design for Shear: Analysis for shear - Components of shear resistance - Modes of Failure - Limit State of collapse for shear - Design of transverse reinforcement.

Module-5

Different anchorage system and design of end block by latest IS codes.

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
1.	VIII	Design of pre stressed concrete	Pre tensioned bars 7& post tensioned bars

6.0 Relevance to Real World

Sl No	Real World Mapping
01	Detailing of Pre stressed concrete

7.0 Gap Analysis and Mitigation

Sl No	Delivery Type	Details
01	Tutorial	Topic: Shear, flexure, Psc

8.0 Books Used and Recommended to Students

Text Books
1. Krishna Raju, N. "Pre stressed Concrete", Tata McGraw Hill Publishing Company, New Delhi 2006
2. Krishna Raju, N., "Pre-stressed Concrete - Problems and Solutions", CBS Publishers and Distributors, Pvt. Ltd., New Delhi.
3. Rajagopalan N, "Pre - stressed Concrete", Narosa Publishing House, New Delhi
Reference Books
1. Praveen Nagarajan, "Advanced Concrete Design", Person Publishers



2. P. Dayaratnam, "Pre stressed Concrete Structures", Scientific International Pvt. Ltd.
3. Lin T Y and Burns N H, 'Design of Pre - stressed Concrete Structures', John Wiley and Sons, New York
4. Pundit G S and Gupta S P, "Pre - stressed Concrete", C B S Publishers, New Delhi
5. IS: 1343: Indian Standard code of practice for Pre stressed concrete, BIS, New Delhi.
6. IS: 3370-Indian Standard code of practice for concrete structures for storage of liquids, BIS, New Delhi.

Additional Study material & e-Books

Class notes and vtu notes

9.0 Relevant Websites (Reputed Universities & Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

<https://en.m.wikipedia.org>

10.0 Magazines/Journals used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	International Journal of MAT	www.matjournals.com

11.0 Examination Note

Scheme of Evaluation for CIE (40 Marks)

➤ **Internal Assessment: 30 Marks**

Total of Three Internal Assessment tests will be conducted for 50 Marks each. Average of three tests is scaled down to 30 Marks.

➤ **Assignment: 10 Marks**

SCHEME OF EXAMINATION: 100 Marks, scaled down to 60 in VTU result sheet.

The question paper will have ten questions.

- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1	1	Introduction and Analysis of Members: Concept of Pre stress.	20
	2	Types of Pre stressing - Advantages - Limitations concrete	
	3	Pre stressing systems - Anchoring devices - Materials	
	4	Mechanical Properties of high strength concrete - high strength steel - Stress-Strain curve for High strength	
	5	Analysis of members at transfer - Stress concept	
	6	Comparison of behavior of reinforced concrete	
	7	pre stressed concrete - Force concept - Load balancing concept	
	8	Kern point -Pressure line	
Module 2	9	Loss of Pre stress due to Elastic shortening, Friction, Anchorage slip	20
	10	Creep of concrete, Shrinkage of concrete and Relaxation of steel	
	11	Total Loss. Deflection and Crack Width Calculations of Deflection due to gravity loads	
	12	Deflection due to prestressing force	
	13	Total deflection - Limits of deflection	
	14	Limits of span-to-effective depth ratio	



	15	Calculation of Crack Width	
	16	Limits of crack width	
Module 3	17	Design of Sections for Flexure	
	18	Numerical Problems	
	19	Analysis of members at ultimate strength	
	20	Numerical Problems	
	21	Preliminary Design	
	22	Numerical Problems	
	23	Final Design for Type I members	
	24	Numerical Problems	
Module 4	25	Design for Shear	
	26	Analysis for shear	
	27	Numerical Problems	
	28	Components of shear resistance	
	29	Modes of Failure	
	30	Limit State of collapse for shear	20
	31	Design of transverse reinforcement	
	32	Numerical Problems	
Module 5	33	Different anchorage system.	
	34	Numerical Problems	
	35	design of end block by latest IS codes	
	36	Numerical Problems	
	37	Solved Previous Year QP	
	38	Numerical Problems	
	39	Numerical Problems	
	40	Numerical Problems	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

sl.No	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: Questions on module 1	Basic knowledge and problem solving skill, design solving skill	Module 1 of the syllabus	3	Individual Activity.	Text 1 Ref Book 2
2	Assignment 2: Questions on module 2	Design of shear, flexure	Module 2 of the syllabus	5	Individual Activity.	Text 1 Ref Book 3

14.0 QUESTION BANK

MODULE 1

- 1) What is Pre stress? Write the Advantages & Dis advantages Between Pre & Post tensioned concrete?
- 2) Explain High Strength concrete & High strength steel ?
- 3) Explain the need and importances of PSC Materials
- 4) Compute the Resultanting stress for rectangular Beam 300mm wide & 400mm deep which is pre stressed with a 600KN at a constant eccentricity of 80mm. The beam carries a UDL of 20KN/m Over a span of 6m.
- 5) A Pre stressed concrete beam, 200mm wide & 300mm deep, is used over an effective span of 6m to support an imposed load of 4KN/m. At the quarter span of the section beam. Find the Magnitude of
 - a) The concentric of Pre stressing force
 - b) The eccentric Pre stressing force i.e $e=50\text{mm}$ When Bottom fibre stress is $=0$



- 6) Write the advantages and Disadvantages of PSC Member over RCC Member
- 7) Explain stress strain curve for Steel.

MODULE 2

- 1) Explain all the losses due to Pre stress
- 2) Briefly Explain the What are the losses in pre stress and reasons for losses ?
- 3) Explain losses due to shrinkage, creep, & Anchorage slip along with the formulas?

MODULE 3





- 1) Explain Ultimate flexure due to strength of Rectangular Beam?
- 2) A pre stressed concrete simply supported rectangular beam in section 200mm wide & 500mm deep is pre stressed by tendons having an area of 600mm² located at 100mm from the soffit of the beam. Given $f_{ck} = 40 \text{ N/mm}^2$ $f_b = 1600 \text{ N/mm}^2$. Estimate the ultimate flexural strength of the beam for the following cases as per IS Code provisions.
 - 1) If the beam is pre tensioned.
 - 2) If the beam is post tensioned with effective bond
 - 3) Post tensioned unbonded tendons

MODULE 4

- 1) Explain how to improve shear resistance?
- 2) Explain types of shear cracks?
- 3) The support section of a PSC Beam 120 x 300 mm is required to carry an ultimate shear force of 120KN. The compressive pre stress at the centroid of the cross section is 5 N/mm². Concrete used M 40 the cover to tension reinforcement is 50mm. If the characteristic strength of steel used for stirrups is $f_e = 415$. design suitable shear reinforcement.

MODULE 5

- 1) Explain type of composite construction?
- 2) Explain anchorage zone stress?

Prepared by	Checked by		
			
Prof. Preethi.R.Patil	Prof. V.I.Patil	HOD	Principal



Subject Title	REHABILITATION AND RETROFITTING		
Subject Code	18CV824	CIE Marks	40
Number of Lecture Hrs / Week	(3:0:0)	SEE Marks	60
Total Number of Lecture Hrs	40	Exam Hours	03
CREDITS – 03			

FACULTY DETAILS:		
Name: Prof. S.S.Beesanakoppa	Designation: Asst. Professor	Experience: 2 Years
No. of times course taught: Nil	Specialization: Wastewater management	

1.0 Prerequisite Subjects:

SLNo	Branch	Semester	Subject
01	Civil Engineering	v	Maintenance of Structure

2.0 Course Objectives

1. Investigate the cause of deterioration of concrete structures.
2. Strategies different repair and rehabilitation of structures.
3. Evaluate the performance of the materials for repair.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to:

SLNo	Course Outcome	RBT Level	POs
C410.1	Identify the causes for structural (Concrete) deterioration.	L1,L2,L3,L4	1,2,3,5,6,8,12
C410.2	Assess the type and extent of damage and carry out damage assessment of structures through various types of tests.	L1,L2,L3,L4	1,2,3,5,6,8,12
C410.3	Recommend maintenance requirements of the buildings and preventive measures against influencing factors.	L1,L2,L3,L4	1,2,3,5,6,8,12
C410.4	Recommend maintenance requirements of the buildings and preventive measures against influencing factors.	L1,L2,L3,L4	1,2,3,5,6,8,12
Total Hours of instruction			40

Module-1

General: Introduction and Definition for Repair, Retrofitting, Strengthening and rehabilitation. Physical and Chemical Causes of deterioration of concrete structures, Evaluation of structural damages to the concrete structural elements due to earthquake.

Module-2

Damage Assessment: Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive and semi destructive testing systems.

Module-3

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.



Module-4

Maintenance and Retrofitting Techniques: Definitions: Maintenance, Facts of Maintenance and importance of Maintenance Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, Externally bonding(ERB) technique, near surface mounted (NSM) technique,

Module-5

Materials for Repair and Retrofitting: 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: Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning.

5.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
1.	VII	Deterioration, Maintenance and Repair of Structures”	structural damages

6.0 Relevance to Real World

Sl No	Real World Mapping
01	Sonar-based real-world mapping and navigation

7.0 Gap Analysis and Mitigation

Sl No	Delivery Type	Details
01	Real-world character image restoration network via	Imges

8.0 Books Used and Recommended to Students

Text Books
1. Sidney, M. Johnson, “Deterioration, Maintenance and Repair of Structures” 2. Denison Campbell, Allen & Harold Roper, “Concrete Structures – Materials, Maintenance and Repair”- Longman Scientific and Technical.
Reference Books
1. R.T.Allen and S.C. Edwards, “Repair of Concrete Structures”-Blakie and Sons 2. Raiker R.N., “Learning for failure from Deficiencies in Design, Construction and Service”- R&D Center (SDCPL). 3. CPWD Manual
Additional Study material & e-Books
Class notes and vtu notes E-Learning Resources : EL1: http://nptel.ac.in/courses/105104099/3 EL2: http://nptel.ac.in/courses/105102089/3

9.0 Relevant Websites (Reputed Universities & Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
https://en.m.wikipedia.org

10.0 Magazines/Journals used and Recommended to Students

Sl.No	Magazines/Journals	Website
1	International Journal	www.constuctionmanagement.com



11.0 Examination Note

Scheme of Evaluation for CIE (40 Marks)

➤ Internal Assessment: 30 Marks

Total of Three Internal Assessment tests will be conducted for 30 Marks each. Average of three tests is scaled down to 30 Marks.

➤ Assignment: 10 Marks

SCHEME OF EXAMINATION: 100 Marks, scaled down to 60 in VTU result sheet.

The question paper will have ten questions.

- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

12.0 Course Delivery Plan

Module	Lecture No.	Content of Lecturer	% of Portion
Module 1	1	Introduction: Introduction and Definition for Repair	20
	2	Retrofitting, Strengthening and rehabilitation	
	3	Physical and Chemical	
	4	Causes of deterioration of concrete structures	
	5	Deterioration of concrete	
	6	Evaluation of structural damages	
	7	Structural damages to the concrete	
	8	Structural elements due to earthquake	
Module 2	9	Damage Assessment	20
	10	Rapid assessment, Investigation of damage	
	11	Evaluation of surface and structural cracks,	
	12	Damage assessment procedure	
	13	destructive, non-destructive	
	14	semi destructive testing	
	15	semi destructive testing systems.	
	16	destructive, non-destructive applications	
Module 3	17	Influence on Serviceability and Durability	20
	18	Effects due to climate, temperature, chemicals, wear and erosion	
	19	Design and construction errors	
	20	corrosion mechanism	
	21	Effects of cover thickness and cracking	
	22	methods of corrosion protection,	
	23	corrosion inhibitors, corrosion resistant steels	
	24	coatings, and cathodic protection	
Module 4	25	Maintenance and Retrofitting Techniques	20
	26	Definitions: Maintenance, Facts of Maintenance	
	27	Importance of Maintenance Need for retrofitting	
	28	retrofitting of structural members	
	29	column and beams by Jacketing technique, Externally bonding(ERB) technique	
	30	near surface mounted (NSM) technique,	
	31	External post tensioning,	
	32	Section enlargement and guidelines for seismic rehabilitation of existing building	
Module 5	33	Artificial fiber reinforced polymer like CFRP, GFRP, AFRP and natural fiber like Sisal and Jute.	20
	34	Adhesive like, Epoxy Resin, Special concretes and mortars, concrete chemicals	
	35	special elements for accelerated strength gain	



	36	Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete	
	37	mortar and dry pack, vacuum concrete	
	38	Guniting and Shot Crete Epoxy injection	
	39	Mortar repair for cracks	
	40	shoring and underpinning	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: Questions on module 1	Students study Identify the major sources of air pollution and understand their effects on health and environment	Module 1 of the syllabus	3	Individual Activity.	Text 1 Ref Book 2
2	Assignment 2: Questions on module 2	Students study the Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models	Module 2 of the syllabus	5	Individual Activity.	Text 1 Ref Book 2
3	Assignment 3: Questions on module 3	Students study Ascertain and evaluate sampling techniques for atmospheric and stack pollutants	Module 3 of the syllabus	8	Individual Activity.	Text 1 Ref Book 2
4	Assignment 4: Questions on module 4	Student study the Choose and design control techniques	Module 4 of the syllabus	10	Individual Activity.	Text 1 Ref Book 2
5	Assignment 5: Questions on module 5	Students Study the particulate and gaseous emissions of noise pollution	Module 5 of the syllabus	12	Individual Activity.	Text 1 Ref Book 3

14.0 QUESTION BANK

MODULE 1

1. Explain the terms Repair, Rehabilitation and Retrofitting of structures with examples?
2. What are the main distress symptoms in a structure?
3. What are the causes for deterioration and distress in structures?
4. What are the various crack repair techniques? Explain
5. Enunciate different causes of cracks in concrete elements
6. How can the defects and cracks be prevented to appear in concrete? How can these be repaired?
7. What are the causes of defects in buildings? Explain with suitable sketches

MODULE 2

1. What is the procedure to assess the damage?
2. Distinguish between structural and non-structural damages in structures.
3. List the poor construction practices causing cracks in concrete?
4. List the type of damages with corresponding causes and preventions
5. Discuss the principle of corrosion and methods to prevent corrosion
6. Describe different methods of excluding external sources of chloride ion from concrete.
7. How is corrosion caused in reinforcing steel in R.C. work? Explain some, of the corrosion control methods commonly adopted
8. Explain the effects of environment on corrosion of reinforcement in R.C.C. Give methods for identifying and quantifying them.
9. What are the methods of evaluation of corrosion in concrete? Give short details of each method.
10. How a steel structure is retrofitted by cathodic protection?



MODULE 3





1. How can you repair the fire damaged concrete? Giving suitable examples
2. On what basis structures are designed to withstand fire?
3. Describe the mechanism of micro-crack due to differential thermal exposure of RCC structure
4. Name the fire damage assessment techniques. Explain any one in detail including its result interpretation.
5. Explain methods of protection against fire
6. How does the load carrying capacity and stress-strain behavior is affected due to elevated temperatures

MODULE 4

1. List the various non destructive testing methods for determining physical conditions of concrete and monitoring of defects. Give short details of the tests.
2. What is the importance of field and laboratory testing for damage assessment of structure?
3. What are the various tools for evaluation of distress in concrete structures.
4. Write short notes on under pinning, Guniting and Shotcrete
5. Give the process of repairing the cracks in concrete structures.
6. Explain repairs in under water structures.

MODULE 5

1. What is meant by Jacketing and different types of jacketing?
2. Explain about autogenous healing and autonomous healing?
3. Describe briefly the methods of strengthening damaged concrete structures
4. According to you, which is more essential, global retrofitting or local retrofitting? Give two reasons.
5. Explain with sketches the two popular non-conventional techniques of global level retrofitting in RC buildings
6. Discuss the evaluation procedure for repair and strengthening of concrete structures?
7. Explain the crack repair using epoxy-injection grouting?
8. Describe the various steps in retrofitting a column in a building
9. What do you understand by health monitoring of structures?
10. What are the objectives of condition survey? In detail explain the various stages of condition survey.
11. Write requirements as per IS: 456 for durability of RCC structure
12. When one should go for demolition rather than rehabilitation of distressed structure? Briefly describe the factors affecting selection of demolition techniques.
13. How to conduct the visual inspection of distress structures?
14. Explain the use of sensors with practical examples

Prepared by	Checked by		
			
Prof. S.S. Bessanakoppa	Prof. Preeti. R. Patil	HOD	Principal