

# **Design of Prestressed Concrete**

**(Course Code: GR20D5022)**

**II Year M.Tech - I Semester**

**(AY: 2022-23)**

**Dr. T. Srinivas**

**Professor of Civil Engineering**



**Department of Civil Engineering**

**Gokaraju Rangaraju Institute of Engineering and Technology**

**Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440**



# Gokaraju Rangaraju Institute of Engineering and Technology

## Department of Civil Engineering

### Design of Prestressed Concrete Structures

#### Course File Check List

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**Department of Civil Engineering**

**M.Tech (Structural Engineering)**

Course Name: Design of Prestressed Concrete

Course Code: GR20D5022

L: 3 T: 0 P:0 C:3

II Year I Semester

**UNIT I Introduction to Prestressed Concrete:** Materials - High strength concrete and High tensile steel - Pre-tensioning and Post tensioning methods – Systems of Prestressing.

**Losses in Prestress:** Losses in Prestress - Analysis of PSC flexural members –Basic concepts-Ultimate strength in flexure –Codal provisions.

**UNIT II Statically Determinate PSC Beams:** Design of flexural members for ultimate and serviceability limit states – Analysis and design for Shear and Torsion - Codal provisions.

**UNIT III Design of End Bocks:** Transmission of prestress in Pre-tensioned members – Anchorage zone stresses for Post-tensioned members.

**UNIT IV Statically Indeterminate Structures:** Analysis and design of continuous beams and frames – Choice of cable profile – Linear transformation and concordancy - Analysis and design of prestressed concrete Pipes and Columns with moments.

**UNIT V Composite Construction:** Analysis and design of composite construction with precast PSC beams and cast in situ RC slabs – Creep and Shrinkage effects – Partial prestressing principles, analysis and design concepts – Crack width calculations.

**TEXT BOOKS:**

1. Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications.

**REFERENCE BOOKS:**

1. Prestressed Concrete by Ramamrutham; Dhanpatrai Publications.
2. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons.

Codes: IS 1343 - BIS code of practice for Prestressed concrete.



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**DEPARTMENT OF CIVIL ENGINEERING**

**CLASS TIME TABLE**

**II YEAR-A SECTION**

**ROOM NO: 4112**

**W.E.F : 15-09-2022**



**Gokaraju Rangaraju Institute of Engineering and Technology**  
**Department of Civil Engineering M.TECH(STE) 2022 II Yr- I Sem**

M.Tech II Year (I-SEM)				2022-23		wef: 15-09-2022	
Day/Time	09:00 - 10:00	10:00-11:00	11:00-12:00	12:00-01:00	01:00-02:00	02:00-03:00	03:00-04:00
Monday	CMEP	CMEP	DPSC	Break		DP-I	
Tuesday	DPSC	DPSC	CMEP			DP-I	
Wednesday		DP-I				DP-I	
Thursday		DP-I				DP-I	
Friday		DP-I				DP-I	
Saturday		DP-I				DP-I	

Sub. Code	Sub.Shortform	Subjects	Faculty Name (Short Code - Staff ID)	Almanac	
GR20D5022	DPSC	Design of Prestressed concrete	Dr.T.Srinivas (1106)	I Spell of Instruction	15-09-2022 to 09-11-2022
				I Mid-term Examinations	10-11-2022 to 11-11-2022
GR20D5146	CMEP	Cost Management of Engineering Projects	Mr.A.Prakash(1502)	II Spell of Instruction	14-11-2022 to 07-01-2023
				II Mid-term Examinations	09-01-2023 to 10-01-2023
GR20D5144	DP-I	Dissertation Phase - I	Mr.V.Ramesh(1646)	Preparation	11-01-2023 to 17-01-2023
				End Semester and Practical Examinations	18-01-2023 to 24-01-2023

Coordinator  
Dr. V Srinivasa Reddy

Time Table Coordinator  
Mr.Rathod Ravinder

Dr.C.Lavanya  
HOD-CE



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**Department of Civil Engineering**

**Vision**

To become a pioneering centre in Civil Engineering and technology with attitudes skills and knowledge.

**Mission**

**M1:** To produce well qualified and talented engineers by imparting quality education.

**M2:** To enhance the skills of entrepreneurship, innovativeness, management and lifelong learning in young engineers

**M3:** To inculcate professional ethics and make socially responsible engineers.

**Programme Educational Objectives (PEOs)**

**PEO1:** Graduates of the program will equip with professional expertise on the theories, process, methods and techniques for building high-quality structures in a cost-effective manner.

**PEO2:** Graduates of the program will be able to design structural components using contemporary softwares and professional tools with quality practices of international standards.

**PEO3:** Graduates of the program will be effective as both an individual contributor and a member of a development team with professional, ethical and social responsibilities.

**PEO4:** Graduates of the program will grow professionally through continuing education, training, research, and adapting to the rapidly changing technological trends globally in structural engineering.

**Programme Outcomes(POs)**

**PO 1:** An ability to independently carry out research / investigation and development to solve practical problems

**PO 2:** An ability to write and present a substantial technical report / document.

**PO 3:** Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor's.

**PO 4:** Assess the impact of professional engineering solutions in an environmental context along with societal, health, safety, legal, ethical and cultural issues and the need for sustainable development.

**PO 5:** Possesses critical thinking skills and solves core, complex and multidisciplinary structural engineering problems.

**PO 6:** Recognize the need for life-long learning to improve knowledge and competence.



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**COURSE OBJECTIVES**

**Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty:** Dr.T.Srinivas

**Designation:** Professor

**Dept.:** Civil Engineering

On completion of this Subject/Course the student shall be able to:

<b>S.No</b>	<b>Objective s</b>
1	Develop an advanced systems of prestressed concrete members
2	Analyze and design the statically determinate prestressed concrete members
3	Demonstrate the stresses with anchorage system in prestressed concrete members.
4	Analyze and design the statically indeterminate prestressed concrete members
5	Analyze and design the composite sections.

Signature of HOD

Signature of faculty

Date:

Date:



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**COURSE OUTCOMES**

**Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty :** Dr.T.Srinivas

**Designation:** Professor

**Dept.:** Civil Engineering

On completion of this Subject/Course the student shall be able to:

S.No	Outcomes
1	Find out the losses in prestressed concrete and enhance its concepts, which include pre and posttensioning processes.
2	Analyze and Design the statically determinate prestressed concrete members.
3	Design the end blocks of prestressed concrete members.
4	Analyze and Design the statically indeterminate prestressed concrete members.
5	Design the composite structures using prestressed concrete techniques.

Signature of HOD

Signature of faculty

Date:

Date:



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**M.Tech II Year I Sem (Structural Engineering )  
Academic Year 2022-2023**

<b>S.No</b>	<b>ROLL NUMBER</b>	<b>NAME OF THE STUDENT</b>
1	21241D2001	ATKAPURAM PRASHANTH
2	21241D2002	BANDI SRI RAM GOPAL
3	21241D2003	CHALLA MADHAVI
4	21241D2004	PAMMI DIVYA
5	21241D2005	DUMMA UMESH KUMAR
6	21241D2006	K LATHASREE
7	21241D2007	MARIYALA VAISHNAVI
8	21241D2008	MAVOORI PRANAV
9	21241D2009	MITTAPALLI NAGA ASHWINI
10	21241D2010	RAVULA VENKATA SURAJ REDDY
11	21241D2011	REPATI MOHAN BABU
12	21241D2012	SANDHYA CHERUKU
13	21241D2013	SHAIK FEROZ
14	21241D2014	SK SAI CHANDRA
15	21241D2015	THOTA HARSHAVARDHAN
16	21241D2016	VARIKUPPALA LALITHA
17	21241D2017	YAMBA RAMA GNANENDRA SAI
18	21241D2018	YENUMALA DEVESH GOUD
19	21241D2019	S PRASHANTH KUMAR
20	21241D2020	BAVANDLAPELLI THARUN TEJA
21	21241D2021	G NITISH KUMAR



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**Department of Civil Engineering**

**GUIDELINES TO STUDY THE COURSE SUBJECT**

**Academic Year** : 2022-2023 **Semester** : I  
**Name of the Program:** M. Tech Structural Engg. **Year:** II Year **Section:** A  
**Course/Subject** : Design of Prestressed Concrete **Course Code:** GR20D5022  
**Name of the Faculty** : Dr.T.Srinivas **Designation:** Professor  
**Dept.:** Civil Engineering

**Guidelines to Students**

Guidelines to study the Course: Design of Prestressed Concrete Structures

The course helps the students to learn the basics and concepts in Prestressed Concrete, High strength concrete and High tensile steel - Pre-tensioning and Post tensioning methods – Systems of Prestressing. Losses in Prestress - Analysis of PSC flexural members –Basic concepts-Ultimate strength in flexure –Codal provisions. Design of flexural members for ultimate and serviceability limit states – Analysis and design for Shear and Torsion. Transmission of prestress in Pre-tensioned members – Anchorage zone stresses for Post-tensioned members. Analysis and design of continuous beams and frames – Choice of cable profile – Linear transformation and concordancy - Analysis and design of prestressed concrete Pipes and Columns with moments. Analysis and design of composite construction with precast PSC beams and cast in situ RC slabs – Creep and Shrinkage effects – Partial prestressing principles, analysis and design concepts – Crack width calculations

**So the students should have the prerequisites:**

Engineering Mechanics, Strength of Materials, Structural Analysis, Concrete Technology, Design of Reinforced Concrete Structures and Design of Steel

**Where will this subject help?**

- Useful in calculation of Design of flexural members for ultimate and serviceability limit states.
- This course let the students to work with analysis and design for Shear and Torsion. Transmission of prestress in Pre-tensioned members.
- This course let the students to analysis and design of prestressed concrete Pipes and Columns with moments
- Analysis and design of composite construction with precast PSC beams and cast in situ RC slabs

## BOOKS AND MATERIALS

<b>Text Books</b>	
1.	Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.
2.	Prestressed Concrete by N.Rajasekharan; - Narosa publications

  

<b>Suggested / Reference Books</b>	
1.	Prestressed Concrete by Ramamrutham; Dhanpatrai Publications
2.	Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons.
3.	Codes: IS 1343 - BIS code of practice for Prestressed concrete.

  

<b>Web Sites</b>	
1	<a href="https://nptel.ac.in/courses/105106117">https://nptel.ac.in/courses/105106117</a>
2	<a href="https://nptel.ac.in/courses">https://nptel.ac.in/courses</a>



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**COURSE DESIGN AND DELIVERY SYSTEM (CDD)**

- The Course syllabus is written into number of learning objectives and outcomes.
- These learning objectives and outcomes will be achieved through lectures, assessments, assignments, experiments in the laboratory, projects, seminars, presentations, etc.
- Every student will be given an assessment plan, criteria for assessment, scheme of evaluation and grading method.
- The Learning Process will be carried out through assessments of Knowledge, Skills and Attitude by various methods and the students will be given guidance to refer to the text books, reference books, journals, etc.

The faculty be able to –

- Understand the principles of Learning
- Understand the psychology of students
- Develop instructional objectives for a given topic
- Prepare course, unit and lesson plans
- Understand different methods of teaching and learning
- Use appropriate teaching and learning aids
- Plan and deliver lectures effectively
- Provide feedback to students using various methods of Assessments and tools of Evaluation
- Act as a guide, advisor, counselor, facilitator, motivator and not just as a teacher alone

Signature of HOD

Signature of faculty

Date:

Date:



# Gokaraju Rangaraju Institute of Engineering and Technology

## Department of Civil Engineering

### COURSE SCHEDULE

**Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty :** Dr.T.Srinivas

**Designation:** Professor

**Dept.:** Civil Engineering

**The Schedule for the whole Course / Subject is:**

S. No.	Description	Duration (Date)		Total No. Of Periods
		From	To	
1.	<b>UNIT I</b>	19-09-2022	31-10-2022	15
2.	<b>UNIT II</b>	01-11-2022	05-12-2022	11
3.	<b>UNIT III</b>	06-12-2022	20-12-2022	8
4.	<b>UNIT IV</b>	26-12-2022	03-01-2023	6
5.	<b>UNIT V</b>	09-01-2023	17-01-2023	6

1. Total No. of Instructional periods available for the course: **46** Hours / Periods



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**Department of Civil Engineering  
SCHEDULE OF INSTRUCTIONS  
COURSE PLAN**

**Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty** : Dr.T.Srinivas

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**Dept.:** Civil Engineering

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	Bloom Taxonomy	References (Text Book, Journal...) Page Nos.:_____to
1.	1.	19/09/2022	1	Introduction to prestressed concrete	COB's - 1 CO's - 1	K1	674-675
	2.	20/09/2022	1	Definitions involved in PSC	COB's - 1 CO's - 1	K2	674-675
	3.	20/09/2022	1	Assumptions and materials	COB's - 1 CO's - 1	K2	674-680
	4.	26/09/2022	1	Types of prestressing and devices	COB's - 1 CO's - 1	K2	674-730
	5.	27/09/2022	1	Bending stress concepts	COB's - 1 CO's - 1	K2	674-730
	6.	27/09/2022	1	Problem Solving	COB's - 1 CO's - 1	K4	684-730
	7.	10/10/2022	1	Problem Solving	COB's - 1 CO's - 1	K4	674-730
	8.	11/10/2022	1	Pressure line Concept and problem	COB's - 1 CO's - 1	K2	674-730
	9.	11/10/2022	1	Problem Solving	COB's - 1 CO's - 1	K4	674-675
	10.	17/10/2022	1	Concept of load balancing and Problem Solving	COB's - 1 CO's - 1	K3	674-675

	11	18/10/20 22	1	Problem Solving	COB's - 1 CO's - 1	K3	674-680
	12	18/10/20 22	1	Cracking Moment and Problem Solving	COB's - 1 CO's - 1	K3	674-730
	13	25/10/20 22	1	Losses of Prestressing	COB's - 1 CO's - 1	K2	674-730
	14	25/10/20 22	1	Problem Solving	COB's - 1 CO's - 1	K3	684-730
	15	31/10/20 22	1	Problem Solving	COB's - 1 CO's - 1	K3	674-730
2.	16	01/11/20 22	1	Shear of PSC Beams	COB's - 2 CO's - 2	K2	425-426
	17	01/11/20 22	1	Problem Solving	COB's - 2 CO's - 2	K3	425-426
	18	07/11/20 22	1	Problem Solving	COB's - 2 CO's - 2	K3	425-429
	19	08/11/20 22	1	Types of cracks and Problem solving	COB's - 2 CO's - 2	K3	425-429
	20	08/11/20 22	1	Torsion of PSC Beams	COB's - 2 CO's - 2	K4	451-465
	21	14/11/20 22	1	Problem Solving	COB's - 2 CO's - 2	K4	482-483
	22	15/11/20 22	1	Design of Shear problem	COB's - 2 CO's - 2	K4	482-514
	23	15/11/20 22	1	Design of Torsion problem	COB's - 2 CO's - 2	K4	451
	24	28/11/20 22	1	Problem Solving	COB's - 2 CO's - 2	K4	451
	25	29/11/20 22	1	Problem Solving	COB's - 2 CO's - 2	K4	451
	26	05/12/20 22	1	Problem Solving	COB's - 2 CO's - 2	K4	451
3.	27	06/12/20 22	1	Transfer of Prestress in Pretensioned member	COB's - 3 CO's - 3	K2	601-603
	28	06/12/20 22	1	Problem on transmission length	COB's - 3 CO's - 3	K3	601-622
	29	12/12/20 22	1	Problem on transmission length	COB's - 3 CO's - 3	K3	601-618
	30	13/12/20 22	1	Flexural bond stresses	COB's - 3 CO's - 3	K3	601
	31	13/12/20 22	1	Problem Solving	COB's - 3 CO's - 3	K3	601
	32	19/12/20 22	1	Problem Solving	COB's - 3 CO's - 3	K3	601-615
	33	20/12/20 22	1	Anchorage Zone or End Block	COB's - 3 CO's - 3	K3	601-610
	34	20/12/20 22	1	Problem Solving	COB's - 3 CO's - 3	K3	601-628
	35	26/12/20 22	1	Analysis and design of continuous beam	COB's - 4 CO's - 4	K4	620-646
4.	36	27/12/20 22	1	Analysis and design of frame	COB's - 4 CO's - 4	K4	413-468
	37	27/12/20 22	1	Analysis and design of pipes	COB's - 4 CO's - 4	K4	413-468

	38	02/01/20 23	1	Analysis and design of columns	COB's - 4 CO's - 4	K4	413-468
	39	03/01/20 23	1	Problems on columns	COB's - 4 CO's - 4	K4	413-468
	40	03/01/20 23	1	Problems on columns	COB's - 4 CO's - 4	K4	413-468
5.	41	09/01/20 23	1	About composite construction	COB's - 5 CO's - 5	K2	413-468
	42	10/01/20 23	1	Problem on propped construction	COB's - 5 CO's - 5	K3	413-468
	43	10/01/20 23	1	Problem on propped construction	COB's - 5 CO's - 5	K3	1051-1090
	44	16/01/20 23	1	Problem on unpropped construction	COB's - 5 CO's - 5	K3	1051-1090
	45	17/01/20 23	1	Differential shrinkage of composites	COB's - 5 CO's - 5	K3	1051-1090
	46	17/01/20 23		Deflections of composites	COB's - 5 CO's - 5	K3	1056-1105



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**Department of Civil Engineering  
SCHEDULE OF INSTRUCTIONS  
UNIT PLAN**

**Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty :** Dr.T.Srinivas

**Designation:** Professor

**Dept.:** Civil Engineering

**Unit No:** 1

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Text Book, 2 by Krishna Raju) Page Nos.: to
1.	19/09/2022	1	Introduction to prestressed concrete	COB's - 1 CO's - 1	K1	674-675
2.	20/09/2022	1	Definitions involved in PSC	COB's - 1 CO's - 1	K2	674-675
3.	20/09/2022	1	Assumptions and materials	COB's - 1 CO's - 1	K2	674-680
4.	26/09/2022	1	Types of prestressing and devices	COB's - 1 CO's - 1	K2	674-730
5.	27/09/2022	1	Bending stress concepts	COB's - 1 CO's - 1	K2	674-730
6.	27/09/2022	1	Problem Solving	COB's - 1 CO's - 1	K4	684-730
7.	10/10/2022	1	Problem Solving	COB's - 1 CO's - 1	K4	674-730
8.	11/10/2022	1	Pressure line Concept and problem	COB's - 1 CO's - 1	K2	674-730
9.	11/10/2022	1	Problem Solving	COB's - 1 CO's - 1	K4	674-675
10.	17/10/2022	1	Concept of load balancing and Problem Solving	COB's - 1 CO's - 1	K3	674-675
11.	18/10/2022	1	Problem Solving	COB's - 1 CO's - 1	K3	674-680
12.	18/10/2022	1	Cracking Moment and Problem Solving	COB's - 1 CO's - 1	K3	674-730

13.	25/10/2022	1	Losses of Prestressing	COB's - 1 CO's - 1	K2	674-730
14.	25/10/2022	1	Problem Solving	COB's - 1 CO's - 1	K3	684-730
15.	31/10/2022	1	Problem Solving	COB's - 1 CO's - 1	K3	674-730



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**Department of Civil Engineering**

**SCHEDULE OF INSTRUCTIONS**

**UNIT PLAN**

**Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty :** Dr.T.Srinivas

**Designation:** Professor

**Dept.:** Civil Engineering

**Unit No:** 2

<b>Lesso n No.</b>	<b>Date</b>	<b>No. of Peri ods</b>	<b>Topics / Sub – Topics</b>	<b>Objectives &amp; Outcomes Nos.</b>	<b>Blooms Taxonomy</b>	<b>References (Text Book, 2 by B S Krishna Raju) Page Nos.: to</b>
1.	01/11/2022	1	Shear of PSC Beams	COB's -2 CO's - 2	K2	425-426
2.	01/11/2022	1	Problem Solving	COB's -2 CO's - 2	K3	425-426
3.	07/11/2022	1	Problem Solving	COB's -2 CO's - 2	K3	425-429
4.	08/11/2022	1	Types of cracks and Problem solving	COB's -2 CO's - 2	K3	425-429
5.	08/11/2022	1	Torsion of PSC Beams	COB's -2 CO's - 2	K4	451-465
6.	14/11/2022	1	Problem Solving	COB's -2 CO's - 2	K4	482-483
7.	15/11/2022	1	Design of Shear problem	COB's -2 CO's - 2	K4	482-514
8.	15/11/2022	1	Design of Torsion problem	COB's -2 CO's - 2	K4	451
9.	28/11/2022	1	Problem Solving	COB's -2 CO's - 2	K4	451
10.	29/11/2022	1	Problem Solving	COB's -2 CO's - 2	K4	451
11.	05/12/2022	1	Problem Solving	COB's -2 CO's - 2	K4	451

Signature of HOD  
Date:

Signature of faculty  
Date:



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**Department of Civil Engineering**

**SCHEDULE OF INSTRUCTIONS**

**UNIT PLAN**

**Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty** : Dr.T.Srinivas

**Designation:** Professor

**Dept.:** Civil Engineering

**Unit No:** 3

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Krishna Raju) Page Nos.:__ to __
1.	06/12/2022	1	Transfer of Prestree in Pretensioned member	COB's -3 CO's - 3	K2	601-603
2.	06/12/2022	1	Problem on transmission length	COB's -3 CO's - 3	K3	601-622
3.	12/12/2022	1	Problem on transmission length	COB's -3 CO's -3	K3	601-618
4.	13/12/2022	1	Flexural bond stresses	COB's -3 CO's - 3	K3	601
5.	13/12/2022	1	Problem Solving	COB's -3 CO's - 3	K3	601
6.	19/12/2022	1	Problem Solving	COB's -3 CO's - 3	K3	601-615
7.	20/12/2022	1	Anchorage Zone or End Block	COB's -3 CO's - 3	K3	601-610
8.	20/12/2022	1	Problem Solving	COB's -3 CO's - 3	K3	601-628

Signature of HOD

Signature of faculty

Date:

Date:



**Gokaraju Rangaraju Institute of Engineering and Technology**  
**Department of Civil Engineering**  
**SCHEDULE OF INSTRUCTIONS**  
**UNIT PLAN**

**Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty :** Dr.T.Srinivas

**Designation:** Professor

**Dept.:** Civil Engineering

**Unit No:** 4

Lesson No.	Date	No. of Periods	Topics / Sub – Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (by Krishna Raju) Page Nos.: __to
1.	26/12/2022	1	Analysis and design of continuous beam	COB's - 4 CO's - 4	K4	413-468
2.	27/12/2022	1	Analysis and design of frame	COB's - 4 CO's - 4	K4	413-468
3.	27/12/2022	1	Analysis and design of pipes	COB's - 4 CO's - 4	K4	413-468
4.	02/01/2023	1	Analysis and design of columns	COB's - 4 CO's - 4	K4	413-468
5.	03/01/2023	1	Problems on columns	COB's - 4 CO's - 4	K4	413-468
6.	03/01/2023	1	Problems on columns	COB's - 4 CO's - 4	K4	413-468

Signature of HOD

Signature of faculty

Date:

Date:



**Gokaraju Rangaraju Institute of Engineering and Technology**  
**Department of Civil Engineering**  
**SCHEDULE OF INSTRUCTIONS**  
**UNIT PLAN**

**Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty:** Dr.T.Srinivas

**Designation:** Professor

**Dept.:** Civil Engineering

**Unit No:** 5

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Krishna Raju) Page Nos.: to
1.	09/01/2023	1	About composite construction	COB's - 5 CO's - 5	K2	413-468
2.	10/01/2023	1	Problem on propped construction	COB's - 5 CO's - 5	K3	413-468
3.	10/01/2023	1	Problem on propped construction	COB's - 5 CO's - 5	K3	1051-1090
4.	16/01/2023	1	Problem on unpropped construction	COB's - 5 CO's - 5	K3	1051-1090
5.	17/01/2023	1	Differential shrinkage of composites	COB's - 5 CO's - 5	K3	1051-1090
6.	17/01/2023	1	Deflections of composites	COB's - 5 CO's - 5	K3	1056-1105

Signature of HOD

Signature of faculty

Date:

Date:



**Gokaraju Rangaraju Institute of Engineering and Technology  
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**Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440**

**LESSON PLAN**

Academic Year : 2022-23 Date: 19/09/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:1 Duration of Lesson: 1hr

Lesson Title: Introduction to prestressed concrete

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

1. Discuss different terminologies in Prestressing Concrete.

Teaching Aids : white board,  
Different colour markers Teaching Points :

Introduction to prestressed concrete

**Assignment / Questions:**

1. Explain basic assumptions in Prestressed Concrete Structures. COB1, CO1
2. Discuss about Tendons, Anchorages, Pre Tensioning. COB2, CO2

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**LESSON PLAN**

Academic Year : 2022-23 Date: 20/09/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:2 Duration of Lesson: 1hr

Lesson Title: Definitions involved in PSC

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

1. Assumptions in Prestressing concrete

Teaching Aids : white board,  
Different colour markers Teaching Points :

Different terminologies and materials used in Prestressing Concrete.

Assignment / Questions:

1. List few applications of Prestressing Concrete. COB1, CO1
2. Discuss the differences between Pre tensioning and Post Tensioning. COB1, CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 20/09/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:3 Duration of Lesson: 1hr

Lesson Title: Assumptions and materials

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Assumptions and materials

Teaching Aids : white board,  
Different colour markers Teaching Points :

Assumptions and materials

Assignment / Questions:

1. Explain in detail about different materials used in Prestressed Concrete. COB1, CO 1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 26/09/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:4 Duration of Lesson: 1hr

Lesson Title: Types of prestressing and devices

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

1. Discuss types of prestressing and devices used

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Types of prestressing and devices

Assignment / Questions:

1. Explain about the devices used in Prestressing. COB1, CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 27/09/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:5 Duration of Lesson: 1hr

Lesson Title: Bending stress concepts

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Bending stress concepts

Teaching Aids : white board,  
Different colour markers Teaching Points :

Bending stress concepts

Assignment / Questions:

1. Explain about analysis of pre stress and bending stress. COB1, CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 27/09/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No: 6 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving in Prestressing beams

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving

**Assignment / Questions:**

1. A rectangular Concrete beam of 100mm wide and 250mm deep, spanning over 8m is prestressed by a straight cable carrying an effective force of 250KN located at an eccentricity of 40mm. Calculate the resultant stress distribution for the centre of span. COB1, CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 10/10/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:7 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Bending stress problems due to dead load and live load.

Assignment / Questions:

1. Find the magnitude of prestressing force with an eccentricity of 40mm which can balance the stresses due to dead load and live load at the soffit of beam. COB1,CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 11/10/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:8 Duration of Lesson: 1hr

Lesson Title: Pressure line Concept and problem

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Pressure line Concept and problem

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Pressure line Concept and problem

Assignment / Questions:

1. A rectangular concrete beam 250mm wide and 600mm deep is prestressed by means of 4 nos of 14mm dia located at 200mm from the soffit of the beam. If the effective stress in the wires is 700N/mm. What is the maximum bending moment that can be applied to the section without causing any tension at the soffit of the beam. COB 1, CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 11/10/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:9 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Pressure line Concept Problems

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving on pressure line concept

Assignment / Questions:

1. A Prestressed concrete beam with a rectangular section 120mm and 300mm deep supports a UDL of 4KN/m which includes the self -weight of the beam. Effective span of beam is 6m. The beam is concentrically prestressed by a cable carrying a force of 180KN. Locate the position of pressure line in beam. COB1,CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 17/10/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:10 Duration of Lesson: 1hr

Lesson Title: Concept of load  
balancing and Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Concept of load balancing and Problem Solving

Teaching Aids : white board,  
Different colour markers Teaching Points :

Concept of load balancing and Problem Solving

Assignment / Questions:

1. Find the effective prestressing force in the parabola cable having eccentricity of 80mm at the centre of the span and concentric at the supports for the following Conditions. If the bending effect of the pre stressing force is nullified by imposed load neglecting self weight of beam.

COB1, CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 18/10/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No: 11 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving

Assignment / Questions:

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 18/10/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:12 Duration of Lesson: 1hr

Lesson Title: Cracking Moment and Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Cracking Moment and Problem Solving

Teaching Aids : white board,  
Different colour markers Teaching Points :

Cracking Moment and Problem Solving

**Assignment / Questions:**

1. Post tensioned concrete slab of length 8m, depth 300mm, width 200mm, eccentricity 100mm, live load of 2.56 KN/m. Calculate the increasing steel stress if the ducts are grouted so that the strain in steel and adjacent concrete is equal. COB1, CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 25/10/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:13 Duration of Lesson: 1hr

Lesson Title: Losses of Prestressing

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Explain various Losses of Prestress

Teaching Aids : white board,  
Different colour markers Teaching Points :

Losses of Prestressing

Assignment / Questions:

1. Explain about various losses of Prestress in Concrete and factors affecting them.

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**LESSON PLAN**

Academic Year : 2022-23 Date: 25/10/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:14 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving

Assignment / Questions:

1. Explain various losses of prestress in Pre tensioning and Post tensioning.

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**LESSON PLAN**

Academic Year : 2022-23 Date: 31/10/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:15 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving

Assignment / Questions:

1. A rectangular section of 150mm X 300mm is prestressed by 8 high tensile wires of 7mm diameter located at 100mm from the soffit of the beam if the wires are tensioned to a stress of 1100 N/mm<sup>2</sup>. Calculate the % loss of stress due to elastic deformation. COB1,CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 01/11/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:16 Duration of Lesson: 1hr

Lesson Title: Shear of PSC Beams

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Shear of PSC Beams

Teaching Aids : white board,  
Different colour markers Teaching Points :

Shear of PSC Beams

**Assignment / Questions:**

1. A rectangular section of width 150mm and depth 300mm, eccentricity =100mm, Length is 8m, Live load of 2KN/m. Estimate principal stresses at the support section. Determine the effective force in the cable to balance dead load and live load. COB2, CO2

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**LESSON PLAN**

Academic Year : 2022-23 Date: 01/11/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:17 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Problem Solving in shear of Prestressed concrete beam.

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving

**Assignment / Questions:**

1. A rectangular section of width 250mm and depth 600mm, the beam is prestressed by parabolic cable with  $P= 1000\text{KN}$  cable is concentric at the support ,  $e=100\text{mm}$  at centre of span,  $L=10\text{m}$ ,  $\text{UDL} =20\text{KN/m}$ , density  $=24\text{KN/m}^3$ . Estimate the maximum principal stress developed in the section of beam at a distance of 300mm away from the support.

COB2, CO2

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**LESSON PLAN**

Academic Year : 2022-23 Date: 07/11/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:18 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Problem Solving in principal stresses developed in the PSC beam.

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Problem Solving in principal stresses developed in the PSC beam.

**Assignment / Questions:**

1. Calculate the magnitude of principal stress at a point 550mm from the top of cantilever beam at the support section. cantilever beam of length 8m carrying UDL of 60KN/m and 350KN at free end with c/s 600mm X 1000mm

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**LESSON PLAN**

Academic Year : 2022-23 Date: 08/11/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:19 Duration of Lesson: 1hr

Lesson Title: Types of cracks and Problem solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Types of cracks and Problem solving

Teaching Aids : white board,  
Different colour markers Teaching Points :

Types of cracks and Problem solving

Assignment / Questions:

1. Explain a brief note on web shear cracks and Flexural shear cracks.

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**LESSON PLAN**

Academic Year : 2022-23 Date: 08/11/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:20

Duration of Lesson: 1hr

Lesson Title: Torsion of PSC Beams

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Torsion of PSC Beams

Teaching Aids : white board,  
Different colour markers Teaching Points :

Torsion of PSC Beams

**Assignment / Questions:**

1. The girder of I section is prestressed by a cable having initial stress of 6000KN. The last ratio is 0.85. Estimate Ultimate shear resistance. Width and depth of top flange= 1200X500mm  
Web of 150mm X 1500mm, width and dept of bottom flange = 300mm X 150mm

COB1, CO1

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**LESSON PLAN**

Academic Year : 2022-23 Date: 14/11/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:21 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Design of Shear Reinforcement

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving in shear reinforcement design.

**Assignment / Questions:**

1. A rectangular c/s of 150mm X 300mm ,  $V=130\text{Kn}$ . The uniform prestress  $F_{cp}= 5 \text{ N/mm}^2$ ,  $f_{ck}= 40\text{N/mm}^2$ ,  $f_e 415$ , HYSD of 8mm diameter. Design suitable spacing of stirrups. Assume cover of 50mm. COB2, CO2

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**LESSON PLAN**

Academic Year : 2022-23 Date: 15/11/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:22 Duration of Lesson: 1hr

Lesson Title: Design of Shear problem

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Design of Shear problem

Teaching Aids : white board,  
Different colour markers Teaching Points :

Design of Shear problem

Assignment / Questions:

1. Discuss various steps involved in the design of shear reinforcement in Prestressed concrete beam COB2, CO2

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**LESSON PLAN**

Academic Year : 2022-23 Date: 15/11/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:23 Duration of Lesson: 1hr

Lesson Title: Design of Torsion problem

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Design of Torsion problem

Teaching Aids : white board,

Different colour markers Teaching Points :

Design of Torsion problem

Assignment / Questions:

1. Determine the maximum torque if the section is uniformly prestressed by a force of 450KN. The maximum permissible diagonal tensile stress in concrete is 0.63 N/mm<sup>2</sup>.

COB2, CO2

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 28/11/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:24

Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving in shear and Torsion in Prestressed Concrete beam

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Problem Solving in shear and Torsion in Prestressed Concrete beam

Assignment / Questions:

1. Determine the amount of non-Prestressed reinforcement required for the section if the torsional resistance moment of section is to be incurred to 345 KN-m. The permissible tensile stress in the steel is 230N/mm<sup>2</sup>. Use 50mm cover COB2, CO2

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 29/11/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:25 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Design of longitudinal reinforcement in Prestressed concrete beam

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving in design of longitudinal reinforcement

Assignment / Questions:

1. Explain the detailed procedure involved in longitudinal reinforcement and transverse reinforcement. COB2, CO2

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 05/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:26 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving

Assignment / Questions:

1. Discuss about Skew bending theory.

COB2, CO2

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 06/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:27

Duration of Lesson: 1hr

Lesson Title: Transfer of Prestress in Pretensioned member

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Transfer of Prestress in Pretensioned member

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Transfer of Prestress in Pretensioned member

Assignment / Questions:

1. Discuss about Transmission Length using various theories.

COB 3, CO 3

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 06/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:28

Duration of Lesson: 1hr

Lesson Title: Problem on  
transmission length

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem on transmission length

Teaching Aids : white board,

Different colour markers Teaching Points :

Problem on transmission length

Assignment / Questions:

1. Calculate the transmission length at the end of the pretensioned beam as per Hoyer's method using following data:  $L=50\text{m}$ , dia of wire =7mm COB3, CO3

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 12/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:29 Duration of Lesson: 1hr

Lesson Title: Problem on transmission length

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Problem on transmission length

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem on transmission length

Assignment / Questions:

1. Estimate the transmission length at the end of a pretensioned beam prestressed by 7mm dia. Adopt Krishnamurthy empirical formula.  $f_{ck} = 42 \text{ N/mm}^2$  COB3, CO3

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 13/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:30 Duration of Lesson: 1hr

Lesson Title: Flexural bond stresses

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Flexural bond stresses in Prestressed Concrete beam

Teaching Aids : white board,  
Different colour markers Teaching Points :

Flexural bond stresses

**Assignment / Questions:**

1. A rectangular cross section of 240mm X 500mm, length of 10m carrying point loads 250KN at  $1/3^{\text{rd}}$  distance from both simply supported ends. Compute bond stress between cable Hose and Concrete. COB3, CO3

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**LESSON PLAN**

Academic Year : 2022-23 Date: 13/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:31

Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving in bond stresses between cable and concrete

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Problem Solving in bond stresses between cable and concrete

Assignment / Questions:

1. A rectangular cross section of 300mm X 600mm, length of 10m carrying point loads 350KN at  $1/3^{\text{rd}}$  distance from both simply supported ends. Compute bond stress between cable and Concrete. COB3, CO3

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 19/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:32 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving in bond stresses

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Problem Solving in bond stresses

**Assignment / Questions:**

1. A rectangular cross section of 240mm X 500mm, length of 10m carrying point loads 250KN at 1/3<sup>rd</sup> distance from both simply supported ends. Compute bond stress between cable Hose and Concrete. COB3, CO3

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 20/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:33

Duration of Lesson: 1hr

Lesson Title: Anchorage Zone or End Block

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Anchorage Zone or End Block

Teaching Aids : white board,

Different colour markers Teaching Points :

Anchorage Zone or End Block

Assignment / Questions:

1. Discuss about anchorage zone stresses in Post tensioned members.

COB3, CO3

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 20/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:34 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Problem Solving in anchorage zone stresses

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Anchorage zone stresses problem Solving

Assignment / Questions:

1. Discuss about various steps involved in determining Anchorage stresses. COB3,CO3

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 26/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:35

Duration of Lesson: 1hr

Lesson Title: Analysis and design of continuous beam

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Analysis and design of continuous beam

Teaching Aids : white board,  
Different colour markers

Teaching Points :

advantages of continuous beam and its applications in PSC

Assignment / Questions:

1. Discuss about effect of prestressing in Continuous beams. COB4, CO4

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**LESSON PLAN**

Academic Year : 2022-23 Date: 27/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:36 Duration of Lesson: 1hr

Lesson Title: Analysis and design of frame

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Analysis and design of Continuous beams

Teaching Aids : white board,  
Different colour markers Teaching Points :

Analysis and design of Continuous beams

Assignment / Questions:

1. A continuous prestressed concrete beam ABC ( $AB = BC = 10$  m) has a uniform rectangular cross-section with a width of 100 mm and depth of 300 mm. The cable carrying an effective prestressing force of 360 kN is parallel to the axis of the beam and located at 100 mm from the soffit. (a) Determine the secondary and resultant moment at the central support B. (b) If the beam supports an imposed load of 1.5 kN/m, calculate the resultant stresses at top and bottom of the beam at B. Assume density of concrete as 24 kN/m. (e) Locate the resultant line of thrust through beam AB. COB4, CO4

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**LESSON PLAN**

Academic Year : 2022-23 Date: 27/12/2022  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:37 Duration of Lesson: 1hr

Lesson Title: Analysis and design of pipes

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Analysis of Continuous beams

Teaching Aids : white board,

Different colour markers Teaching Points :

Analysis of Continuous beams

Assignment / Questions:

1. A prestressed beam having a rectangular cross section with a width of 120 mm and a depth of 300 mm is continuous over two spans. AB = 8 m. The cable with zero eccentricity at Statically Indeterminate Structures 449 the ends and an eccentricity of 50 mm towards the top fibres of the beam over the central support, carries an effective force of 500 kN
  - (a) Calculate the secondary moment developed at B.
  - (b) If the beam supports concentrated loads of 20 kN each at mid-points of span, evaluate the resultant stresses at the central support section B.
  - (c) Locate also the position of the pressure line at section. COB4, CO4

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**LESSON PLAN**

Academic Year : 2022-23 Date: 02/01/2023  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:38 Duration of Lesson: 1hr

Lesson Title: Analysis and design of columns

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Analysis and design of columns

Teaching Aids : white board,  
Different colour markers Teaching Points :

Analysis and design of columns

Assignment / Questions:

1. A two span continuous beam ABC is simply supported at A and C and continuous over B. It is pre-stressed with straight cable which lies 100mm below CGC. Determine the second moment at 'B' if  $F = 120\text{kN}$ . Take  $AB = BC = 8\text{m}$ . COB4, CO4

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**LESSON PLAN**

Academic Year : 2022-23 Date: 03/01/2023  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:39 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving

**Assignment / Questions:**

1. Beam of uniform section shown in Fig. 9.13 as pre-stress concrete with an effective pre-stressing force of 300kN.
  - a. Sketch the C-line due to the pre-stress alone
  - b. Suggest a concordant cable profile
  - C. Determine SM and secondary reactions
  - d. Also sketch the C-line when the span AB and BC carry imposed load of 15kN/m and 5kN/m respectively. Also determine the stress distribution across the section which lies at 'B.

COB4, CO4

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**LESSON PLAN**

Academic Year : 2022-23 Date: 03/01/2023  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:40 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving

Assignment / Questions:

1. Design a continuous PSC beam of two spans AB and BC of 12m in length to support a UDL of 10KN/m. Tensile stresses are not permitted in concrete and the compressive strength on concrete is not to exceed 13MPa. Sketch the details of the cable profile and check the stresses developed at the support and span sections. COB4,CO4

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**LESSON PLAN**

Academic Year : 2022-23 Date: 09/01/2023  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:41 Duration of Lesson: 1hr

Lesson Title: About composite construction

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Advantages and disadvantages about composite construction

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Advantages and disadvantages about composite construction

Assignment / Questions:

1. Explain briefly about advantages and disadvantages of Composite construction.  
COB5, CO5

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**LESSON PLAN**

Academic Year : 2022-23 Date: 10/01/2023  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:42 Duration of Lesson: 1hr

Lesson Title: Problem on propped construction

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problem on propped construction

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem on propped construction

Assignment / Questions:

1. Mention the differences between propped and Unpropped construction.

COB5,CO5

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**LESSON PLAN**

Academic Year : 2022-23 Date: 10/01/2023  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:43 Duration of Lesson: 1hr

Lesson Title: Problems on propped construction

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Propped construction problem

Teaching Aids : white board,  
Different colour markers Teaching Points :

Analysis of propped construction

Assignment / Questions:

1. a) A composite T-girder of span 5 m is made up of a pretensioned rib of 100 mm wide and 200 mm deep, with an in-situ cast slab of 400 mm wide and 40 mm thick. The rib is prestressed by a straight cable having an eccentricity of 33.33 mm and carrying an initial force of 150kN. The loss of prestress may be assumed to be 15%. Design and check the composite T-beam for the limit state of deflection if it supports an imposed load of 3.2 KN/m for unpropped construction. Assume  $E$  as 35kN/m<sup>2</sup> for both.

COB5,CO5

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**LESSON PLAN**

Academic Year : 2022-23 Date: 16/01/2023  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:44 Duration of Lesson: 1hr

Lesson Title: Problem Solving

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:  
Problem Solving on unproped construction

Teaching Aids : white board,  
Different colour markers Teaching Points :

Problem Solving

Assignment / Questions:

1. Summarize the advantages of using unproped composite construction with prestressed and in situ concrete in structural members. COB5,CO5

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**LESSON PLAN**

Academic Year : 2022-23 Date: 17/01/2023  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor

Lesson No:45

Duration of Lesson: 1hr

Lesson Title: Flexural and Shear Strength

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Problems on differential shrinkage

Teaching Aids : white board,  
Different colour markers

Teaching Points :

Flexural and Shear Strength

Assignment / Questions:

1. A composite T Beam is made up of a pretensioned rib 100 mm wide and 200 mm deep and a cast in situ slab, 400 mm wide and 40 mm thick having a modulus of elasticity of 28 KN/mm<sup>2</sup>. If the differential shrinkage is  $100 \times 10^{-6}$  units, estimate the shrinkage stresses developed in the precast and cast in situ units. COB5, CO5

Signature of Faculty



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**LESSON PLAN**

Academic Year : 2022-23 Date: 11/1/2021  
Semester : II Year I Semester  
Name of the Program : M.Tech Section : A  
Course/Subject : Design of Prestressed Concrete Course Code: GR20D5022  
Name of the Faculty : Dr. T. Srinivas  
Designation : Professor  
Lesson No:46 Duration of Lesson: 1hr

Lesson Title: Design of composite section

**Instructional/Lesson Objectives:**

On completion of this lesson the student shall be able to:

Design of composite section

Teaching Aids : white board,  
Different colour markers Teaching Points :

Design of composite section

Assignment / Questions:

1. Discuss various steps involved in the design of composite section. COB5, CO5

Signature of Faculty

**Gokaraju Rangaraju Institute of Engineering and Technology**

**Department of Civil Engineering**

**COURSE COMPLETION STATUS**

**Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty :** Dr.T.Srinivas

**Designation:** Professor

**Dept.:** Civil Engineering

<b>Units</b>	<b>Remarks</b>	<b>No. of Objectives Achieved</b>	<b>No. of Outcomes Achieved</b>
Unit 1	Covered on time	1	1
Unit 2	Covered on time	1	1
Unit 3	Covered on time	1	1
Unit 4	Covered on time	1	1
Unit 5	Covered on time	1	1

Signature of HOD

Signature of faculty

Date:

Date:



**Gokaraju Rangaraju Institute of Engineering and Technology**  
**Department of Civil Engineering**  
**EVALUATION STRATEGY**

1. **Academic Year** : 2022-2023

**Semester** : I

**Name of the Program:** M. Tech Structural Engg.

**Year:** II Year **Section:** A

**Course/Subject** : Design of Prestressed Concrete

**Course Code:** GR20D5022

**Name of the Faculty** : Dr.T.Srinivas

**Designation:** Professor

**Dept.:** Civil Engineering

2. **TARGET:**

a) Percentage for pass: 90%

b) Percentage of class:

Total Strength: 21

First class with distinction	10
First class	6
Pass class	5
Total strength (No's)	21

3. **COURSE PLAN & CONTENT DELIVERY**

- 46 classes held for detailed demonstration of each topic and for analysis of problems in the class.

3 **METHOD OF EVALUATION**

3.1 **Continuous Assessment Examinations**

- **Assignments:** Assignments to assess the knowledge of the student on the basics and concepts in Prestressed Concrete, High strength concrete and High tensile steel - Pre-tensioning and Post tensioning methods – Systems of Prestressing. Losses in Prestress - Analysis of PSC flexural members –Basic concepts- Ultimate strength in flexure –Codal provisions. Design of flexural members for ultimate and serviceability limit states – Analysis and design for Shear and Torsion. Transmission of prestress in Pre-tensioned members – Anchorage zone stresses for Post-tensioned members. Analysis and design of continuous beams and frames – Choice of cable profile – Linear transformation and concordancy - Analysis and design of prestressed concrete Pipes and Columns with moments. Analysis and design of composite construction with precast PSC beams and cast in situ RC slabs – Creep and Shrinkage effects – Partial prestressing principles, analysis and design concepts – Crack width calculations.
- **Seminars:** To assess the knowledge of the student in Prestressed Concrete.
- **Quiz:** To assess the knowledge of the student in various concepts and basics in Prestressed Concrete.
- **Internal Examination:** Internal Examinations to assess their overall knowledge in Prestressed Concrete.

### **3.2. Semester/End Examination**

To test their abilities in the course Design of Prestressed Concrete Structures and to approve their abilities learnt during the same.

- 4.** List out any new topic(s) or any innovation you would like to introduce in teaching the subjects in this Semester.

Introduce drawing of reinforcement details.

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Signature of HOD

Date:

Signature of faculty

Date:



**Gokaraju Rangaraju Institute of Engineering and Technology  
(Autonomous)**

**Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440**

**Mappings of CO's, COB's Vs PO's, POB's**

**Course Objectives - Course Outcomes Relationship Matrix**

**Assessment:**

1. Assignment    2. Internal Examination    3. External Examination
4. Practical Projects    5. Viva

GR20D5022/ Design of Prestressed Concrete Structures	Course Outcomes				
	1	2	3	4	5
Course Objectives					
1	X				
2		X			
3			X		
4				X	
5					X

GR20D5022/ Design of Prestressed Concrete Structures	Course Outcomes				
	1	2	3	4	5
Assessments					
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X

GR20D5022/ Design of Prestressed Concrete Structures	Course Objectives				
Assessments	1	2	3	4	5
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X

GR20D 5022	Design of Prestressed Concrete Structures	1.Find out the losses in prestressed concrete and enhance its concepts, which include pre and post tensioning processes	M			M	H	H
		2.Analyze and Design the statically determinate prestressed concrete members.	M	M	H			H
		3.Design the end blocks of prestressed concrete members	M	M			H	H
		4.Analyze and Design the statically indeterminate prestressed concrete members	M	M	H			H
		5.Design the composite structures using prestressed concrete techniques	M		M		H	H