POORNIMA
COLLEGE OF ENGINEERING

INDEX

Name of Faculty	**Mr. Niraj Kumar Bharti**
Class-	**B.Tech – V SEM**
Branch	**Civil Engineering**
Course Code	**5CE4-02**
Course Name	**Structural Analysis-I**
Session	**(2023-2024)**

POORNIMA COLLEGE OF ENGINEERING, JAIPUR
DEPARTMENT OF CIVIL ENGINEERING

RAJASTHAN TECHNICAL UNIVERSITY, KOTA
Syllabus
3rd Year - V Semester: B.Tech. (Civil Engineering)

5CE4-02: STRUCTURE ANALYSIS-I

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Indeterminate structures, Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), Releases in structures, Maxwell's reciprocal theorem and Betti's theorem. Analysis of prop cantilever structures, Analysis of Indeterminate Structure (fixed and continues beams) using Area moment method, Conjugate beam method, Three moments Theorem.	11
3	Analysis of Statically Indeterminate Structures using Slope-deflection method and Moment-distribution method applied to continuous beams and portal frames with and without inclined members	11
4	**Vibrations:** Elementary concepts of structural vibration, Mathematical models, basic elements of vibratory system. Degree of freedom. Equivalent Spring stiffness of springs in parallel and in series. **Simple Harmonic Motion**: vector representation, characteristic, addition of harmonic motions, Angular oscillation. **Undamped free vibration of SDOF system**: Newton's law of motion, D Almbert's principle, deriving equation of motions, solution of differential equation of motion, frequency & period of vibration, amplitude of motion; Introduction to damped and forced vibration.	5
	TOTAL	28

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF CIVIL ENGINEERING

Campus: Poornima College of Engineering **Class/Section: 3rd** **Date: 03/08/2023**
Course: B.Tech. **Year/ Section - A**
Name of Faculty: Mr. Niraj Kumar Bharti **Name of Subject :Structural Analysis-I** **Code: 5CE4-02**

ACTIVITY WISE ASSESSMENT TOOLS

Sr. No.	Activity	Assessment Method	Tools	Weightage Marks	Recommendation
1.	Assignment	Direct	Marks	50	For CO1-CO4
2.	Assignment	Direct	Marks	50	For CO1-CO4
3.	MidTerm1	Direct	Marks	60	For CO1-CO4
4.	MidTerm2	Direct	Marks	60	For CO1-CO4

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF CIVIL ENGINEERING

Campus: Poornima College of Engineering **Class/Section: 3rd** **Date: 03/08/2023**

Course: B.Tech. **Year/ Section - A**

Name of Faculty: Mr. Niraj Kumar Bharti **Name of Subject :Structural Analysis-I** **Code: 5CE4-02**

Time Table

Department of Civil Engineering

Teacher Niraj Kumar Bharati

Minha Escola

	1 8:00 - 9:00	2 9:00 - 10:00	3 10:00 - 11:00	LUNCH 11:00 - 11:50	4 11:50 - 12:50	5 12:50 - 13:50	6 13:50 - 14:50
Mo	(3CE4-07) BMC 1004 III SEM					(5CE4-02) SA-I 2004 V SEM	
Tu			(3CE4-07) BMC 1004 III SEM			(5CE4-02) SA-I 2004 V SEM	
We	(5CE4-02) SA-I 2004 V SEM					(3CE4-24) CEM Lab 4011 III SEM B2	
Th							
Fr		(3CE4-24) CEM Lab 4011 III SEM B1					(3CE4-07) BMC 1004 III SEM
Sa	(5CE4-02) SA-I 2004 V SEM		(5CE4-02) SA-I 2004 V SEM			(3CE4-21) I.T.S 1004 III SEM	(3CE4-21) I.T.S 1004 III SEM

Dr.P.N Dadhich (H.O.D) TIME TABLE COORDINATOR - SUPRIYA BANSAL aSc Timetables

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF CIVIL ENGINEERING

Campus: Poornima College of Engineering **Class/Section: 3rd** **Date: 03/07/2023**

Course: B.Tech. **Year/ Section - A**

Name of Faculty: Mr. Niraj Kumar Bharti **Name of Subject:Structural Analysis-I** **Code: 5CE4-02**

COURSE PLAN (Deployment)

Campus: PCE **Course : B.Tech** **Class/Section: III Year/V** **Sem. Date: 22/07/2023**

Name of Faculty: Mr. Niraj Kumar Bharti **Name of Subject :Structure Analysis-I** **Code 5CE4-02**

S.no.	TOPIC AS PER UNIVERSITY SYLLABUS	Lect No	Planned Del.Date	Actual Del. Date	Reason for Deviation
	ZERO LECTURE	L1			
1	**UNIT- I Introduction to indeterminate structures** ➢ Introduction ➢ Types of supports • Reaction component • Redundancy ➢ Types of structure • Statically determinate structure • Statically indeterminate structure • Difference between determinate and indeterminate structures Degrees of freedom per node ➢ Degree of freedom	L2 L3 L4 L5			

	➢ Degree of indeterminacy • Articulated structure • Rigid jointed frames • Numerical practices Maxwell's reciprocal ➢ Maxwell's law of reciprocal • Condition for application • Maxwell's equations Betti's theorem ➢ Betti's theorem • Betti's Statement • Betti's Equation Moment Area method ➢ Three moments Theorem ➢ Moment Area method • Introduction • Mohr's theorem • Mohr's theorem I • Mohr's theorem II • Conclusion Conjugate beam method ➢ Conjugate beam method • Introduction • Conjugate beam method • Relationship between	L6 L7 L8 L9 L10 L11 L12 L13 L14 L15 L16 L17			

	an actual beam and conjugate beam • Conclusion				
2	**UNIT II**				
	Slope Deflection method ➢ Introduction ➢ Relationship between slope, deflection and radius of curvature ➢ Sign conventions ➢ Basic Equation ➢ Analysis of Beams & Frames without Sway ➢ Analysis of Beams & Frames with Sway ➢ Numerical Moment Distribution method ➢ Introduction ➢ Sign conventions ➢ Carry Over Factor for: • Beam fixed at one end and SS at other end • SS at both ends • Numerical ➢ Stiffness Factor ➢ Distribution Factor ➢ Analysis of Beams & Frames without Sway	L18 L19 L20 L21 L22 L23 L24 L25 L26 L27 L28 L29 L30 L31 L32 L33			

	➢ Analysis of Beams & Frames with Sway	L34			
3	**UNIT III**				
	Vibrations ➢ Vibrations • Elementary concepts of structural vibration • Mathematical models • basic elements of vibratory system • Degree of freedom • Equivalent Spring stiffness of springs in parallel and in series. Simple Harmonic Motion ➢ Simple Harmonic Motion • vector representation • characteristic • addition of harmonic motions • Angular oscillation Undamped free vibration of SDOF system • Newton's law of motion • D Almbert's principle • deriving equation of motions • solution of differential	L35 L36 L37 L38 L39 L40 L41 L42			

	equation of motion • frequency & period of vibration • amplitude of motion • Introduction to damped and forced vibration				

Mr. Niraj Kumar Bharti
Assistant Professor

POORNIMA COLLEGE OF ENGINEERING, JAIPUR
DEPARTMENT OF Civil ENGINEERING

Campus: Poornima College of Engineering **Class/Section: 3rd** **Date: 12 July 2023**

Course: B.Tech. **Year/ Section - A**

Name of Faculty: Niraj Kumar Bharti **Name of Subject :Structural Analysis-I** **Code: 5CE4-02**

COURSE PLAN –BLOWN UP

Campus: PCE Course: B.Tech	**Class/Section: V**	**Date: 12/08/2023**
Name of Faculty: Niraj Kumar Bharti	**Name of Subject: Structure Analysis-I**	**Code: 5CE4-02**

S.No.	**Topic as per Syllabus**	**BLOWN UP TOPICS (Up to 10 TIMES SYLLABUS)**
1	ZERO LECTURE	Introduction to the Subject and its Significance.
2	Introduction to indeterminate structures Degrees of freedom per node	➢ Introduction ➢ Types of supports • Reaction component • Redundancy ➢ Types of structure • Statically determinate structure • Statically indeterminate structure • Difference between determinate and indeterminate structures ➢ Degree of freedom ➢ Degree of indeterminacy • Articulated structure • Rigid jointed frames • Numerical practices ➢ Maxwell's law of reciprocal

3	Maxwell's reciprocal theorem Betti's theorem Moment Area method Conjugate beam method **UNIT II** Slope Deflection method	• Condition for application • Maxwell's equations ➢ Betti's theorem • Betti's Statement • Betti's Equation ➢ Three moments Theorem ➢ Moment Area method • Introduction • Mohr's theorem • Mohr's theorem I • Mohr's theorem II • Conclusion ➢ Conjugate beam method • Introduction • Conjugate beam method • Relationship between an actual beam and conjugate beam • Conclusion ➢ Introduction ➢ Relationship between slope, deflection and radius of curvature ➢ Sign conventions ➢ Basic Equation ➢ Analysis of Beams & Frames without Sway ➢ Analysis of Beams & Frames with Sway ➢ Introduction

4	Moment Distribution method	➢ Sign conventions ➢ Carry Over Factor for: • Beam fixed at one end and SS at other end • SS at both ends • Numerical ➢ Stiffness Factor ➢ Distribution Factor ➢ Analysis of Beams & Frames without Sway ➢ Analysis of Beams & Frames with Sway
	UNIT III Vibrations	➢ Vibrations • Elementary concepts of structural vibration • Mathematical models • basic elements of vibratory system • Degree of freedom • Equivalent Spring stiffness of springs in parallel and in series.
	Simple Harmonic Motion	➢ Simple Harmonic Motion • vector representation • characteristic • addition of harmonic motions • Angular oscillation
	Undamped free vibration of SDOF system	➢ Undamped free vibration of SDOF system • Newton's law of motion • D Almbert's principle • deriving equation of motions

		• solution of differential equation of motion • frequency & period of vibration • amplitude of motion • Introduction to damped and forced vibration

Niraj Kumar Bharti

Assistant Professor

POORNIMA
COLLEGE OF ENGINEERING

Session: 2023 - 24 (Vth Sem.)

Campus: PCE Course: B.TECH Class/Section: CIVIL ENGINEERING

Name of Faculty: Mr. Niraj Kumar Bharti

Zero Lecture

1). Name of Subject: Structural Analysis-I **Code**: 5CE4-02

2). Self-Introduction:
a). Name: Mr. Niraj Kumar Bharti
b). Qualification: B.Tech Civil Engg, M.Tech (Structural Engg),
c). Designation: Assistant Professor
d). Research Area: Structural Engg.
f). Other details: Structural Engineering is my area of interest which is vital for all Civil Engineering aspects. I will like to share with you, it will enhance your interests towards Structural Engineering subjects likes TOS, SOM, RCC, STEEL STRUCTURE, CONCRETE.

1. Areas of proficiency/expertise:
1.1 Subjects taken:
1.1.1 DCS-1
1.1.2 Fluid Mechanics
1.1.3 Estimating and costing
1.1.4 Building Planning
1.1.5 Construction Technology
1.1.6 Design of Steel Structure
1.1.7 Advance Foundation
1.1.8 Structure Analysis

1.2 Laboratories Taken
1.2.1. Building Planning Lab
1.2.2 Estimation and Valuation lab
1.2.3 Project Lab
1.2.4 Seminar Lab
1.2.5 Design of water Resource Structure -1&2
1.2.6 Advance Foundation Lab

1.3 Academic Proficiency
1.3.1 English
1.3.2 Hindi

1.4 Book Authored
None

3). Introduction of Students:
a*). Records of students in semester Vth*

Attached in Annexure-A

b*). Name of 05 best students based on previous results:*

Reg. No.	Name of Students	Batch	CGPA (%)
PCE21CE039	MS SHIVANI VERMA	2021-2025	91.65
PCE21CE040	SHREYA SHARMA	2021-2025	88
PCE21CE007	ANKIT KUMAR MEENA	2021-2025	86.35
PCE21CE010	DEVANSHI MEENA	2021-2025	82.38
PCE21CE010	NITIN KUMAR	2021-2025	80.24

4). Instructional Language: 100%English

5). Introduction to subject: - This Subject Comprises of a detailed concept of Introduction to indeterminate structures. It also covers various cases of vibration, Simple Harmonic Motion, Undamped free vibration of SDOF system.

a). Relevance to Branch: Structure Analysis-I is a fundamental subject of structure which co-relates with other sections of civil engineering. Structure Analysis-I helps to design the various components like beams, columns, slabs, portal frames and foundations etc.

b). Relevance to Society: Structure Analysis-I provides all engineering aspects of structural components like beam, column etc by which society can be aware for safe, economic and efficiency of structure points of view.

c). Relevance to Self: As the structure engineering is the field of interest SOM reflects as the foundation which elaborates the components of structures. Even in Public sector and government bodies' examination questions from Structure Analysis-I contain a huge number which reflects the importance of subject.

d). Relation with laboratory: The whole syllabus of Structure Analysis-I provides a practice evidence to understand the prospect of structural component. Its practical implementation provides an idea of designing of beam and column. Various theorems and structures are proved & analyze in laboratory.

e). Connection with previous year and next year: Structure Analysis-I itself a foundation of Civil Engineering and it's the base of subject "Strength of material" which gives an idea to student to understand the aspect and prospect of complicated structures like beam, column etc. this subject will help in designing of various components like beams, columns, slabs, portal frames and foundations etc. This subject also provides base to the subjects like Structure Analysis-II, DSS and DCS.

6). Syllabus of Poornima Group of Colleges, Jaipur

Structure Analysis-I (5CE4-02), (L 3, T-1)

Unit-1

Introduction to Indeterminate structures, Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), Releases in structures, Maxwell's reciprocal theorem and Betti's theorem. Analysis of prop cantilever structures, Analysis of Indeterminate Structure (fixed and continues beams) using Area moment method, Conjugate beam method, Three moments Theorem.

Unit-II

Analysis of Statically Indeterminate Structures using Slope-deflection method and Moment-distribution method applied to continuous beams and portal frames with and without inclined members

Unit-III

Vibrations: Elementary concepts of structural vibration, Mathematical models, basic elements of vibratory system. Degree of freedom. Equivalent Spring stiffness of springs in parallel and in series.

Simple Harmonic Motion: vector representation, characteristic, addition of harmonic motions, Angular oscillation.

Undamped free vibration of SDOF system: Newton's law of motion, D Almbert's principle, deriving equation of motions, solution of differential equation of motion, frequency & period of vibration, amplitude of motion; Introduction to damped and forced vibration.

(b). ABC analysis RGB method) of unit & topics

RED: - HARD TOPIC **GREEN: - MEDIUM TOPIC** **BLUE: - EASY TOPIC**

Structure Analysis-I (5CE4-02), (L 3, T-1)

Unit-1

Introduction to Indeterminate structures, Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), Releases in structures, Maxwell's reciprocal theorem and Betti's theorem. Analysis of prop cantilever structures, Analysis of Indeterminate Structure (fixed and continues beams) using Area moment method, Conjugate beam method, Three moments Theorem.

Unit-II

Analysis of Statically Indeterminate Structures using Slope-deflection method and Moment-distribution method applied to continuous beams and portal frames with and without inclined members

Unit-III

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Simple Harmonic Motion: vector representation, characteristic, addition of harmonic motions, Angular oscillation.

Undamped free vibration of SDOF system: Newton's law of motion, D Almbert's principle, deriving equation of motions, solution of differential equation of motion, frequency & period of vibration, amplitude of motion; Introduction to damped and forced vibration.

7). Books/ Website/Journals & Handbooks/ Association & Institution:

a). Recommended Text & Reference Books and Websites:

S. No.	Title of Book	Authors	Publisher	Cost (Rs.)	No. of books in

					Library
Text Books					
T1	Theory of Structure	R.S. Khurmi	S.Chand	240/-	25
T2	Theory of Structure-II	B.C. Punmia	Laxmi Publication	320/-	15
T3	Theory of Structure	Ramamurtham	Dhanpat Rai Publication	595/-	15
T4	Mechanics of materials	B.C. Punmia	Laxmi Publication	350/-	15
Reference Books					
R1	Structure Analysis	Gupta and Pandit	McGraw Hill	395/-	12
R2	Mechanics of Structures	Timoshenko & Young	McGraw Hill	375/-	10
R3	Structural Analysis	Thandavamoorthy	Oxford Publication	655/-	5
Websites related to subject					
1	www.nptel.com				
2	www.mit.org				
3.	www.mathalino.com				

b). Journals & Handbooks: -

CSIR-Structural Engineering Research Centre, Chennai publish "Journal of Structural Engineering" (JOSE).

c). Associations and Institutions: -

1. Indian Association of Structural Engineers.
2. Indian Society of Structural Engineers.

8). Syllabus Deployment: -

a). Total weeks available for academics (excluding holidays) as per Poornima Foundation calendar-

Semester	Vth
No. of Working days available(Approx.)	60
No. of Weeks (Approx.)	12

- Total weeks available for special activities (as mentioned below)- 02 weeks (Approx.)

Note: Individual faculty must calculate the exact no. of lectures available according to time table etc. after consultation with HOD.

b). Special Activities (To be approved by HOD & Dean & must be mentioned in deployment):

- Open Book Test- Two in a semester
- Quiz - Once in a semester
- Special Lectures (SPL)- Minimum 10% of total no. of lectures including following
    i. Smart Class by the faculty, who is teaching the subject
    ii. SPL by expert faculty at PGC level
    iii. SPL by expert from industry/academia (other institution)
- Revision classes (Solving Important Question Bank):- 1 class before Mid Term and 2 classes before End Term Exam

c). Lecture schedule per week

i). University scheme (L+T+P) = 3+3+6

d). Introduction & Conclusion: Each subject, unit and topic shall start with introduction & close with conclusion. In case of the subject, it is Zero lecture.

e). Time Distribution in lecture class: - Time allotted: 60 min.

i. First 5 min. should be utilized for paying attention towards students who were absent for last lecture or continuously absent for many days + taking attendance by calling the names of the students and also sharing any new/relevant information.
ii. Actual lecture delivery should be of 50 min.
iii. Last 5 min. should be utilized by recapping/ conclusion of the topic. Providing brief introduction of the coming up lecture and suggesting portion to read.
iv. After completion of any Unit/Chapter a short quiz should be organized.
v. During lecture student should be encouraged to ask questions**.**

Note: Pl. ensures that each student is having Lecture Note Book. Also, write on the black board day and date, name of the teacher, name of subject with code, unit and lecture no. and topics to be covered at the beginning of each lecture and ensure that students write in lecture note book. Ask students to leave 4/5 pages blank for copying the note from fellow students in case of their absenteeism.

9). Tutorial: - An essential component of Teaching- Learning process in Professional Education.

Objective: - To enhance the recall mechanism.
To promote logical reasoning and thinking of the students.
To interact personally to the students for improve numerical solving ability.

a). *Tutorial processing:* - Tutorial sheet shall be provided to each students

Ist Phase: - It is consisting of questions to be solved in the class assignment session in test mode on perforated sheet given in tutorial notebook and to be collected & kept by respective faculty for review & analysis (20 minutes).

IInd Phase: - Indicating/Initializing the weak issues/ drawback and Evaluating and providing the grade. Making a group with good student for assisting the weak students to explain/solve questions by every student on plain papers given in tutorial note book (20 minutes).

IIIrd Phase: - Solving/ explaining difficulties of lecture class and providing the new home assignment (20 minutes). To be done in tutorial note book.

b). *Home assignment shall comprise of two parts:*

Part (i) Minimum essential questions, which are to be solved and submitted by all with in specified due date.

Part (ii) Other important questions, which may also be solved and submitted for examining and guidance by teacher.

10). Examination Systems:

Sr. No.	Name of the Exam	Max. Marks	% of passing marks	Nature of paper Theory + Numerical	Syllabus coverage (in %)	Conducted by
1.	Ist Mid Term Exam	10	40	25+75	60	PCE
2.	IInd Mid Term Exam	10	40	20+80	40	PCE
3.	University (End) Term Exam	80	30	20+80	100	RTU, Kota

Students must to take calculator

Place & Date:

Name of Faculty with Designation
Mr. Niraj Kumar Bharti
Assistant Professor

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEAPRMENT OF CIVIL ENGINEERING

Assignment-I

Campus: PCE Course: B.TECH	**Year /Semester: 3rd / 5th**	**Date:**
Name of Faculty: Mr. Niraj Kumar Bharti	**Name of Subject: Structural Analysis-I**	**Code: 5CE4-02**

CO	PO	QUESTIONS	MARKS
CO1	**PO1**	**Discuss the concept of degree of freedom and write about the damped and undammed vibrations.**	10
CO2	**PO2**	**Explain the Maxwell's reciprocal theorem and also apply the theorem on a structure to prove the same.**	10

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF CIVIL ENGINEERING

Assignment-1

CO-Gap Identification

	CO					
Overall CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO**
Targets	**2**	**2**	**2**	**3**		**2.25**
Attainments D2	**1.99**	**1.97**				**2.21**
Gap	**0.01**	**0.03**				**0.04**

PO Attainment

PO1	PO2	PSO1	PSO2	PSO3
2	2.5	1.5	2	3
1.60784314		0.82353		
0.39215686		0.67647		

Gaps Identified:

Describe what the reasons for gap are:

1. All appeared students attempt question of CO1 very well but few students get less marks in CO2 due to not attend regular classes.

Activities decided to bridge the gap

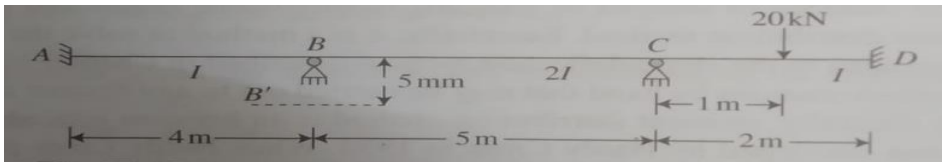
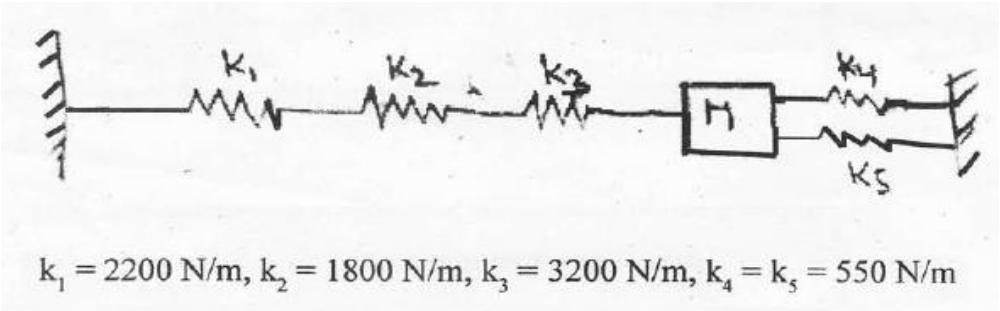
1. Assignment

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEAPRMENT OF CIVIL ENGINEERING

Assignment-II

Campus: PCE Course: B.TECH	Year /Semester: 3rd / 5th	Date:
Name of Faculty: Mr. Niraj Kumar Bharti	Name of Subject: Structural Analysis-I	Code: 5CE4-02

CO	PO	QUESTIONS	MARKS
CO3	**PO3**	**The continuous beam shown in fig. has sunk by an amount of 5 mm at support. Determine the end moments.** 	10
CO4	**PO4**	**Analyze the system as shown in fig. Find M. Such that system has natural frequency of 10 Hz.**  $k_1 = 2200$ N/m, $k_2 = 1800$ N/m, $k_3 = 3200$ N/m, $k_4 = k_5 = 550$ N/m	10

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF CIVIL ENGINEERING

Assignment-2

CO-Gap Identification

	CO					
Overall CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO**
Targets	**2**	**2**	**2**	**3**		**2.25**
Attainments D2	**1.99**	**1.97**	**1.96**	**2.94**		**2.21**
Gap	**0.01**	**0.03**	**0.04**	**0.06**		**0.04**

PO Attainment

PO	PO1	PO2	PSO1	PSO2	PSO3
Targets	**2**	**2.5**	**1.5**	**2**	**3**
Attainments D2	**1.61**	**2.37**	**0.82**	**1.67**	**2.94**
Gap	**0.39**	**0.13**	**0.68**	**0.33**	**0.06**

Gaps Identified:

Describe what the reasons for gap are:

1. All appeared students attempt question of CO3 very well but few students get less marks in CO4, due to not attempt properly.

Activities decided to bridge the gap

1. More Number of problems provided through assignments and class test
2. Practice of repetitive design problems.

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

III B.TECH. (V Sem.) **Roll No. _____**

FIRST MID TERM EXAMINATION 2023-24
Code: 5CE4-02 Category: PCC Subject Name–Structure analysis
(BRANCH – CIVIL ENGINEERING)

Course Credit: ___

Max. Time: 2 hrs. **Max. Marks: 60**

NOTE:- **Read the guidelines given with each part carefully.**

Course Outcomes (CO):

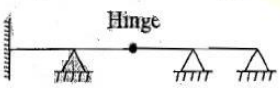
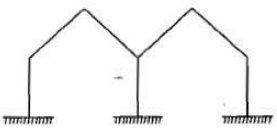
At the end of the course the student should be able to:

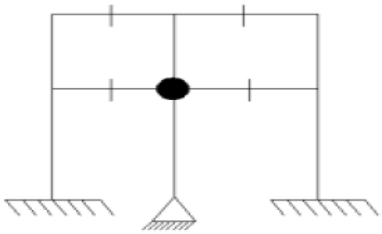
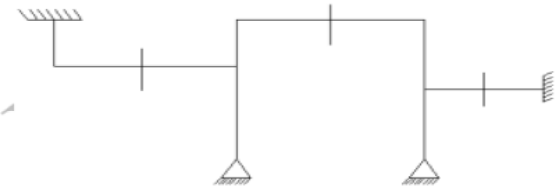
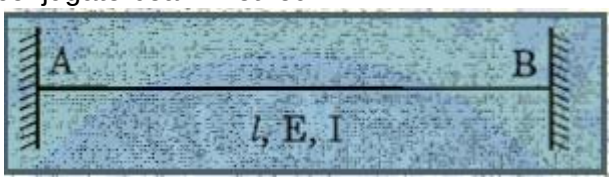
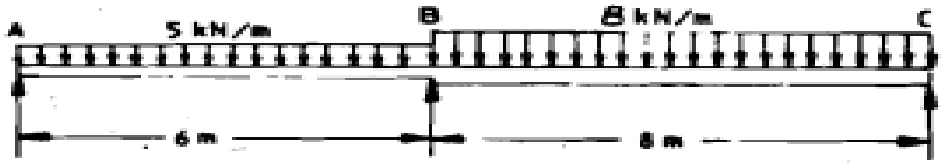
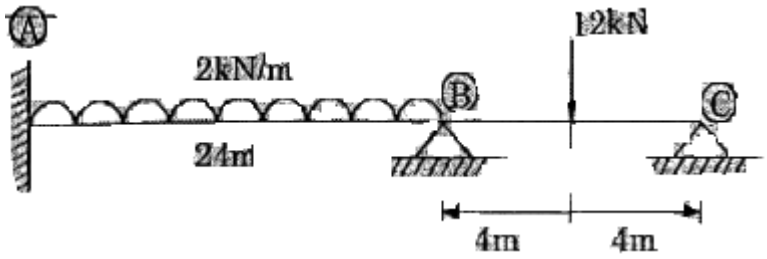
CO1: Able to define basic concepts of structure analysis used in civil engineering

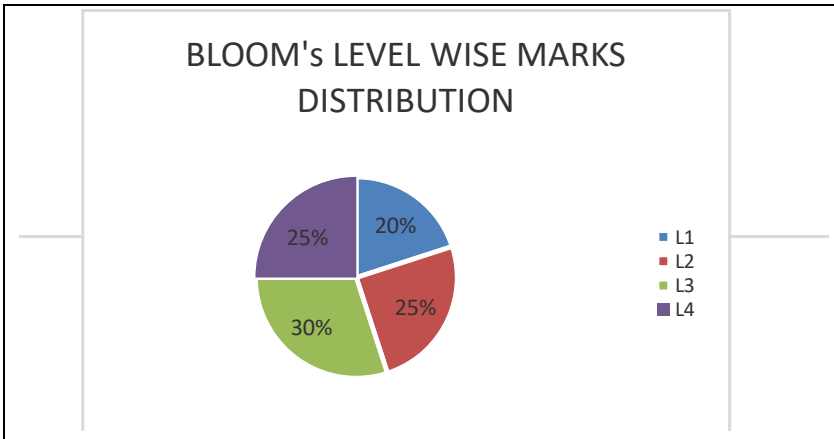
CO2: Able to explain various methods and theorems used for analysis of civil structures.

CO3: Able to apply concepts of Area moment method, Conjugate beam method, three moments theorem, vibration, Mathematical models to analyze building components

CO4: Able to analyze Statically Indeterminate Structures using Slope-deflection method, Moment-distribution method and simple harmonic motion concepts.

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	What do you mean by static indeterminacy?	2	1	1	1
Q.2	Illustrate the different type of supports and their degree of freedom?	**2**	1	1	1
Q.3	Draw a neat diagram to show fixed beam, Cantilever beam, propped cantilever and continuous beam.	**2**	1	1	1
Q.4	Define conjugate beam?	**2**	2	2	1
Q.5	Find the degree of kinematic indeterminacy of single bay portal frame fixed at its base?	**2**	2	2	2
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	Use the Moment Area theorem to solve the slope and deflection at quarter span of the simply supported beam loaded with a point load of P kN at the center of span.	**5**	**3**	**3**	**2**
Q.7	Explain the Maxwell's reciprocal theorem and also apply the theorem on a structure to prove the same.	**5**	**3**	**2**	**1**
Q.8	Match **List-I** (Structure) with **List-II** (Degree of static indeterminacy) and select the correct answer using the codes given below the lists: **List-I** **List-II** A.  1. Three B.  2. Six C.  3. Two D.  4. Four	**5**	**2**	**3**	**2**

Q.9	Find degree of static and kinematic indeterminacy of the following structure  Fig.-1  Fig.-2	**5**	**2**	**3**	**2**
Q.10	Explain Bettis theorem with suitable example.	**5**	**3**	**2**	**1**
Q.11	For a propped cantilever find the reactions using moment area theorem?	**5**	**3**	**3**	**2**
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	If end B settles down by Δ, find the moment generated due to this at A and B using conjugate beam method?  	**10**	**3**	**3**	**2**
Q.13	Analyze continuous beam ABC using three moment equation and Draw Shear force and Bending Moment Diagram. EI is constant.  	**10**	**4**	**4**	**3**
Q.14	Solve the beam using slope deflection method and draw Bending moment diagram.  	**10**	**4**	**4**	**3**
Q. 15	Write down the difference between force and displacement method.	**10**	**1**	**1**	



CO	COURSE OUTCOME W	BL	BLOOM's L
CO1	15	L1	20%
CO2	20	L2	25%
CO3	24	L3	30%
CO4	20	L4	25%

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF CIVIL ENGINEERING

Activity-3

Session 2023-24

Mid Term-I

CO-Gap Identification

CO						
Overall CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO**
Targets	**2**	**2**	**2**	**3**	**-**	**2.25**
Attainments	**1.58**	**1.53**	**1.54**	**2.28**		**1.69**
Gap	**0.42**	**0.47**	**0.46**	**0.72**		**0.56**

PO Attainment

PO					
Overall CO Attainments for PO	**PO1**	**PO2**	**PSO1**	**PSO2**	**PSO3**
Targets	**2**	**2.5**	**1.5**	**2**	**3**
Attainments	**1.1404**	**1.5686**	**0.6184**	**1.0933**	**2.303**
Gap	**0.8596**	**0.9314**	**0.8816**	**0.9067**	**0.697**

Gaps Identified:

Describe what the reasons for gap are:

1. All appeared students attempt question of CO1 very well but few students get less marks in CO2, CO3 and CO4 due to not attempt properly.

Activities decided to bridge the gap

1. More Number of problems provided through assignments and class test
2. Practice of repetitive design problems.

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

III B.TECH. (V Sem.) **Roll No. _____**

SECOND MID TERM EXAMINATION 2023-24

Code: 5CE4-02 Category: PCC Subject Name–Structure analysis

(BRANCH – CIVIL ENGINEERING)

Course Credit: ___

Max. Time: 2 hrs. **Max. Marks: 60**

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

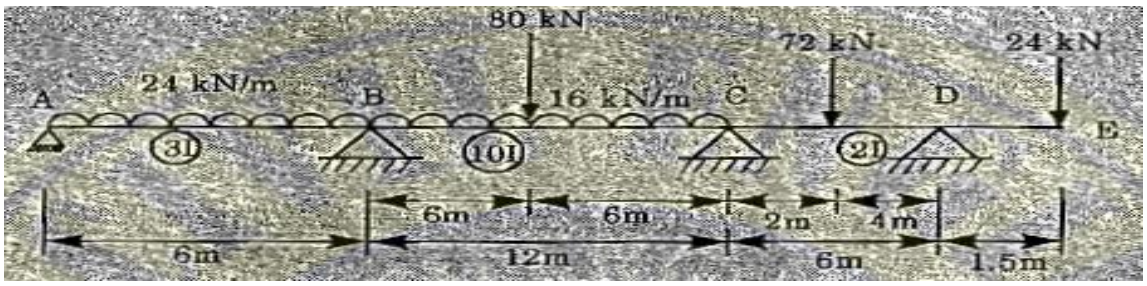
At the end of the course the student should be able to:

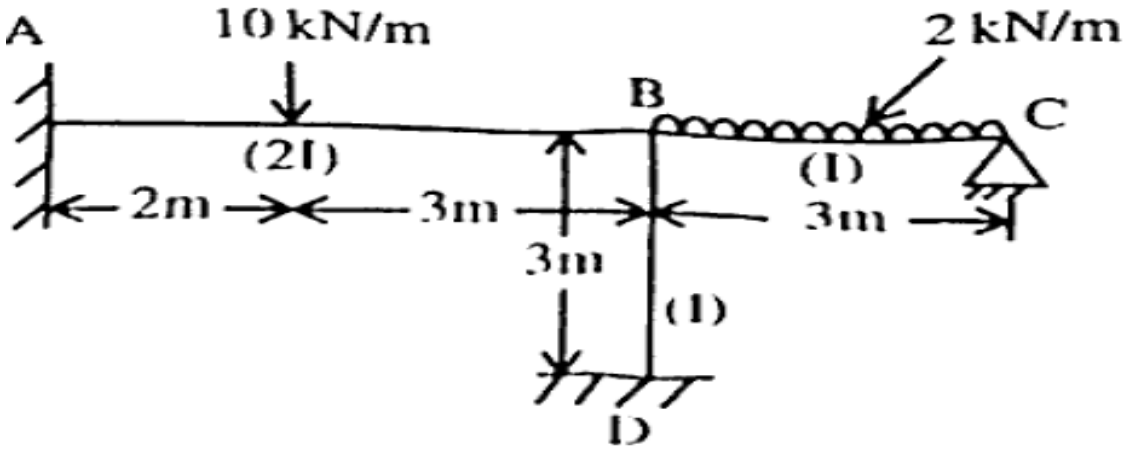
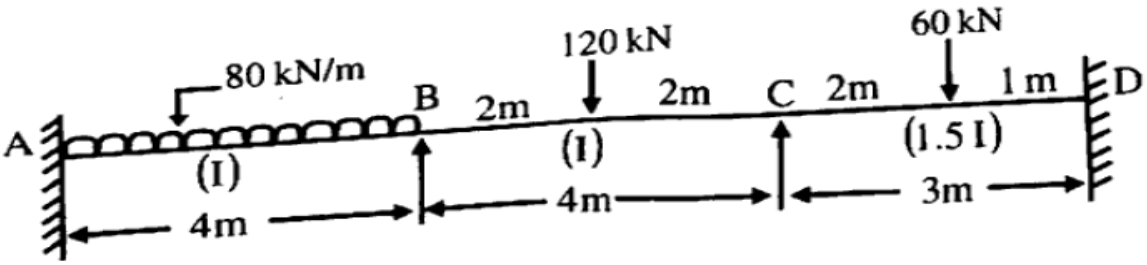
CO1: Able to define basic concepts of structure analysis used in civil engineering

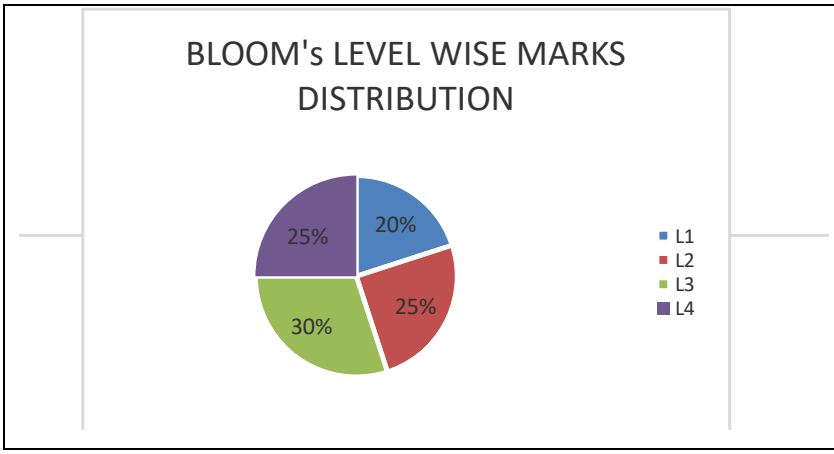
CO2: Able to explain various methods and theorems used for analysis of civil structures.

CO3: Able to apply concepts of Area moment method, Conjugate beam method, three moments theorem, vibration, Mathematical models to analyze building components

CO4: Able to analyze Statically Indeterminate Structures using Slope-deflection method, Moment-distribution method and simple harmonic motion concepts.

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	Define the term stiffness of spring.	2	1	1	1
Q.2	Explain simple harmonic motion.	**2**	1	1	1
Q.3	State D-alembert's Principle.	**2**	1	1	1
Q.4	Define conjugate beam?	**2**	2	2	1
Q.5	Discuss the term time period, amplitude and damping.	**2**	2	2	2
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	Illustrate the following terms for moment distribution method A. Stiffness of the member B. Distribution factor C. Carry over factor	**5**	**3**	**3**	**2**
Q.7	Find distribution factor at each joint for the following figure. 	**5**	**3**	**2**	**1**
Q.8	Write short notes on A. Degree of freedom B. Newton's law of motion C. Three moment theorem	**5**	**2**	**3**	**2**
Q.9	A propped cantilever beam is loaded with point load at center. Find the reaction generated at propped end? Use any method.	**5**	**2**	**3**	**2**

Q.10	Describe damped and forced vibration with neat sketch.	**5**	**3**	**2**	**1**
Q.11	Derive equivalent stiffness for n spring connected in series and in parallel?	**5**	**3**	**3**	**2**
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Describe solution of differential equation of motion in undamped free vibration of Single degree of freedom.	**10**	**3**	**3**	**2**
Q.13	Analyze the following using moment distribution method. 	**10**	**4**	**4**	**3**
Q.14	Solve the beam using moment distribution method and draw Bending moment diagram. 	**10**	**4**	**4**	**3**
Q. 15	Categories and explain types of damping.	**10**	**1**	**1**	**1**



CO	COURSE OUTCOME W	BL	BLOOM's
CO1	15	L1	20%
CO2	20	L2	25%
CO3	24	L3	30%
CO4	20	L4	25%

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF CIVIL ENGINEERING

Activity-4 Mid Term-II

Session 2023-24

CO-Gap Identification

CO						
Overall CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO**
Targets	**2**	**2**	**2**	**3**	**-**	**2.25**
MID I Attainments	**1.581**	**1.533**	**1.535**	**2.28**		**1.688**
Attainments Mid II	**1.8739**	**1.6**	**1.874**	**1.8438**		**1.962**
Attainments Cumulative	**1.7274**	**1.567**	**1.705**	**2.0619**		**1.825**
Gap	**0.2726**	**0.433**	**0.295**	**0.9381**		**0.425**

PO Attainment

PO					
Overall CO Attainments for PO	**PO1**	**PO2**	**PSO1**	**PSO2**	**PSO3**
Targets	**2**	**2.5**	**1.5**	**2**	**3**
MID I Attainments	**1.1404**	**1.569**	**0.618**	**1.0933**	**2.303**
Attainments Mid II	**1.3509**	**1.689**	**0.618**	**0.9375**	**2.8108**
Attainments Cumulative	**1.2456**	**1.629**	**0.618**	**1.0154**	**2.5569**
Gap	**0.7544**	**0.871**	**0.882**	**0.9846**	**0.4431**

Gaps Identified:

Describe what the reasons for gap are:

1. All appeared students attempt question of CO1 very well but few students get less marks in CO2, CO3 and CO4 due to not attempt properly.

Activities decided to bridge the gap

1. More Number of problems provided through assignments and class test
2. Practice of repetitive design problems.

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF CIVIL ENGINEERING

Overall Attainment

Session 2023-24

CO-Gap Identification

GAP ANALYSIS			
CO Attainments	**Overall CO**	**Gap**	
Mid I Attainment	**2.25**	**0.75**	
Mid II Attainment	**2.42**	**0.58**	
RTU Component Attainments	**2.35**	**0.65**	
D2 Attainments	**2.57**	**0.43**	
Overall CO Attainment	**2.50**	**0.50**	
Target	**3**		
Gap Identified			

PO Attainment

PO					
Classwise PO Attainments	**PO1**	**PO2**	**PSO 1**	**PSO2**	**PSO3**
Through Mid I	**1.14**	**1.57**	**0.62**	**1.09**	**2.30**
Through Mid II	**1.35**	**1.69**	**0.62**	**0.94**	**2.81**
Through RTU Component	**1.28**	**1.96**	**0.96**	**1.28**	**2.35**
Through D2	**1.93**	**2.37**	**1.21**	**1.67**	**2.94**
Overall PO attainments through CO	**1.12**	**1.82**	**0.75**	**1.06**	**2.24**
Target	**2.00**	**2.50**	**1.50**	**2.00**	**3.00**
Overall Gap	**0.88**	**0.68**	**0.75**	**0.94**	**0.76**

Gaps Identified:

Describe what the reasons for gap are:

1. All appeared students attempt question of CO1 very well but few students get less marks in CO2, CO3 and CO4 due to not attempt properly due to numerical problems.

Activities decided to bridge the gap

1. More Number of problems provided through assignments and class test in the next year.
2. Practice of repetitive design problems.

POORNIMA
COLLEGE OF ENGINEERING

Summery Sheet

Name of faculty	
Class-	**B. Tech – V SEM**
Branch	**Civil Engineering**
Course Code	**5CE4-02**
Course Name	**Structure Analysis -I**
Session	**(2022-2023)**

COURSE OUTCOMES

After completion of course

CO1: Able to define basic concepts of structure analysis used in civil engineering.

CO2: Able to explain various methods and theorems used for analysis of civil structures.

CO3: Able to apply concepts of Area moment method, Conjugate beam method, three moments theorem, vibration, Mathematical models to analyze building components.

CO4: Able to analyze Statically Indeterminate Structures using Slope-deflection method, Moment-distribution method and simple harmonic motion concepts.

CO-PO/PSO MAPPING AND TARGETS

CO	PO												Avg.	PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	CO Targets	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1
CO2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-	3
CO3	-	2	-	-	-	-	-	-	-	-	-	-	2	-	-	3
CO4	-	3	-	-	-	-	-	-	-	-	-	-	3	-	-	3

Level of course

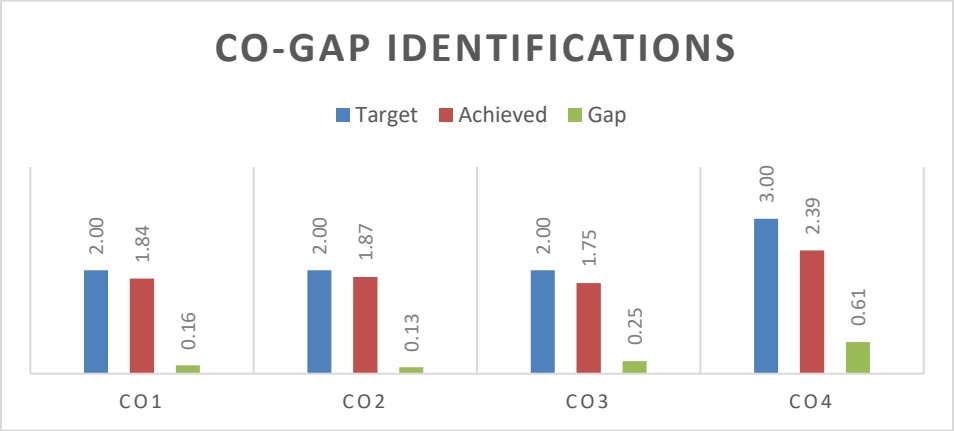
Course Category	Level 3	Level 2	Level 1
A	60% of students getting >60% marks	50-60% of students getting >60% marks	40-50% of students getting >60% marks

ACTIVITY WISE ASSESSMENT TOOLS

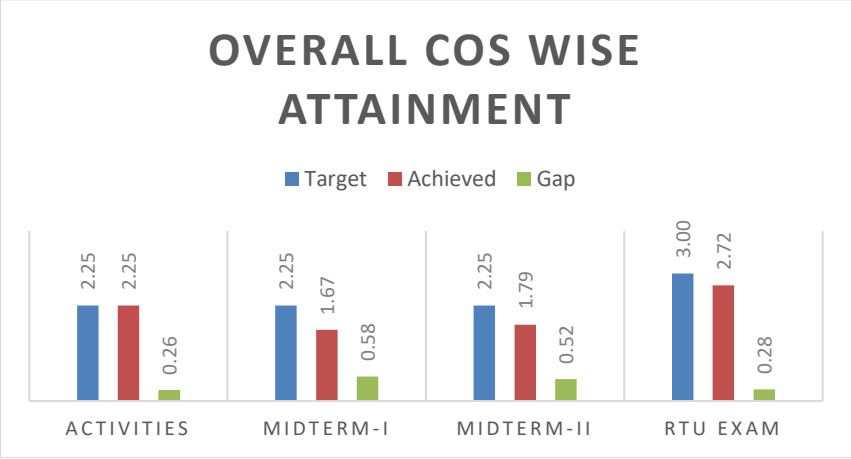
Sr. No.	Activity	Assessment Method	Tools	Weightage Marks	Recommendation
1.	Assignment-I	Direct	Marks	20	For CO1-CO2
2.	Assignment-II	Direct	Marks	20	For CO3-CO4
3.	MidTerm1	Direct	Marks	60	For CO1-CO4
4.	MidTerm2	Direct	Marks	60	For CO1-CO4

CO-GAP IDENTIFICATIONS

COs	CO1	CO2	CO3	CO4
Target	2.00	2.00	2.00	3.00
Achieved	1.84	1.87	1.75	2.39
Gap	0.16	0.13	0.25	0.61



CO: 5CE4-02: SA -I				
	Activities	Midterm-I	Midterm-II	RTU exam
Target	2.25	2.25	2.25	3.00
Achieved	2.25	1.67	1.79	2.72
Gap	0.26	0.58	0.52	0.28



Gaps Identified:
Describe what the reasons for gaps are

1. There is slightly gap in midterm-I.
2. Many No. of students was debarred in this subject in midterm- I and midterm-II, so they got less marks in RTU.

<u>Activities decided to bridge the gap</u>

1. Focus on more numbers of repetitive design problems will be solved in classroom practices and also give to student in assignment.

POs and PSOs GAP IDENTIFICATION

Attainment of PO through CO(Class Test, OBT and Quiz) Component

5CE4-02	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Targets	**2.00**	**2.50**													**2.50**
Achieved	**1.39**	**2.37**													**2.43**
Gap	**0.61**	**0.13**													**0.07**

Attainment of PO through CO(MIDTERM-I) Component

5CE4-02	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Targets	**2.00**	**2.50**													**2.50**
Achieved	**1.09**	**1.44**													**1.39**
Gap	**0.91**	**1.06**													**1.11**

Attainment of PO through CO(MIDTERM-II) Component

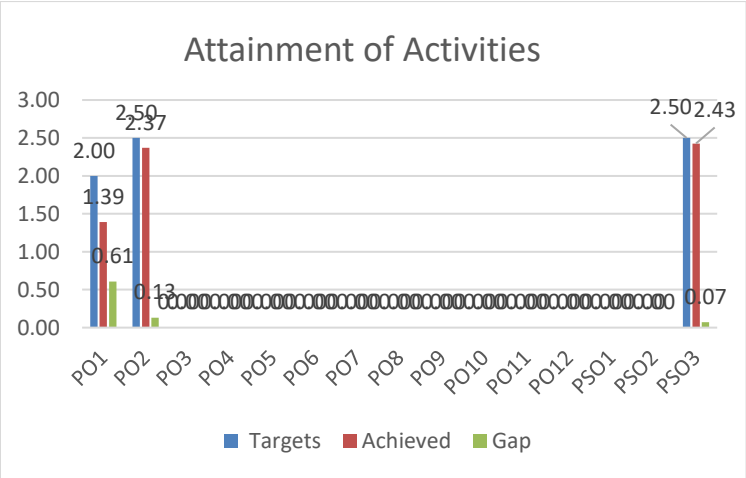
5CE4-02	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Targets	**2.00**	**2.50**													**2.50**
Achieved	**1.37**	**1.25**													**1.53**
Gap	**0.63**	**1.25**													**0.97**

Attainment of PO through CO(RTU) Component

5CE4-02	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Targets	**2.00**	**2.50**													**2.50**
Achieved	**1.39**	**2.27**													**2.27**
Gap	**0.61**	**0.23**													**0.23**

Attainment & Gap of Overall PO Session 2021-22

5CE4-02	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Targets	**2.00**	**2.50**													**2.50**
Achieved	**1.09**	**2.08**													**1.67**
Gap	**0.91**	**0.42**													**0.83**



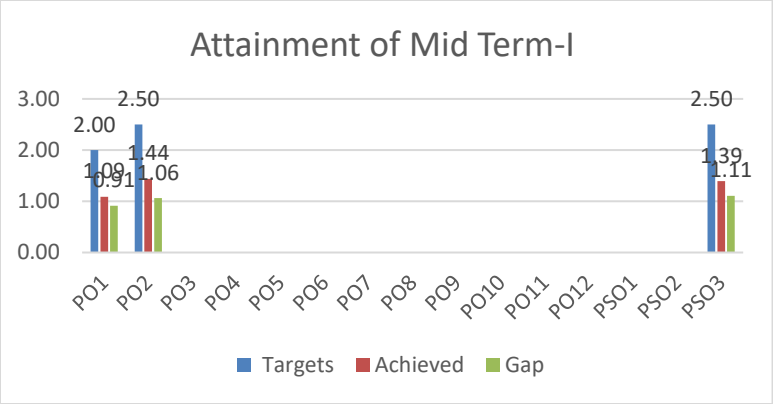
Gaps Identified:

Describe what the reasons for gaps are

1. PO2 achieved but gap is identified in PO1 because few students get the less marks in design problems and attainment target is 3

Activities decided the gap

1. More assignments and practice of repetitive design problems.



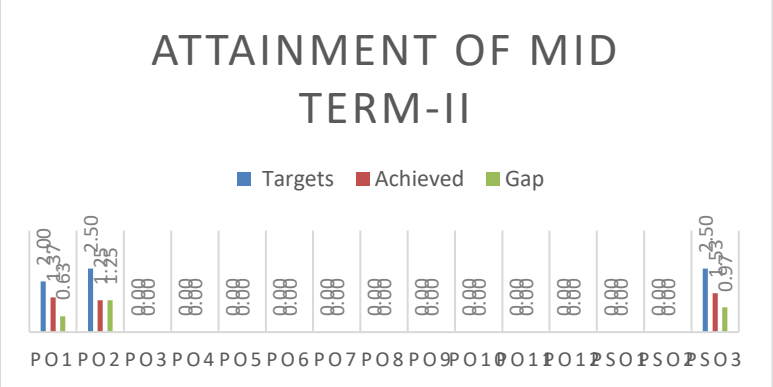
Gaps Identified:

Describe what the reasons for gaps are

1. There is a gap in PO2 because few students was absent in design class and get the less marks in design problems.

Activities decided the gap

1. More assignments and practice of repetitive design problems to selected



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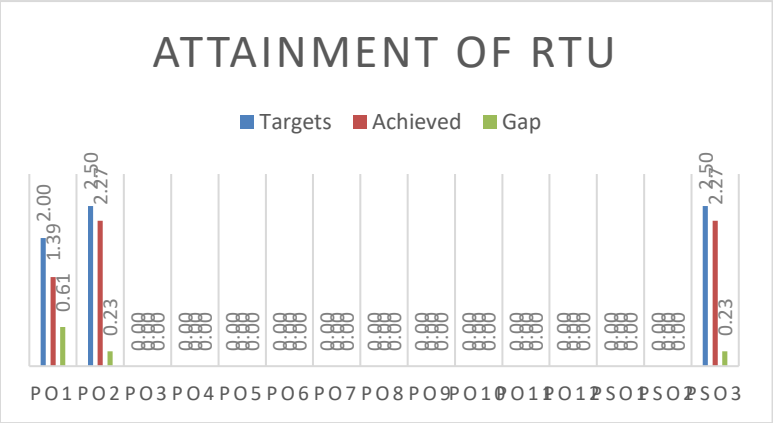

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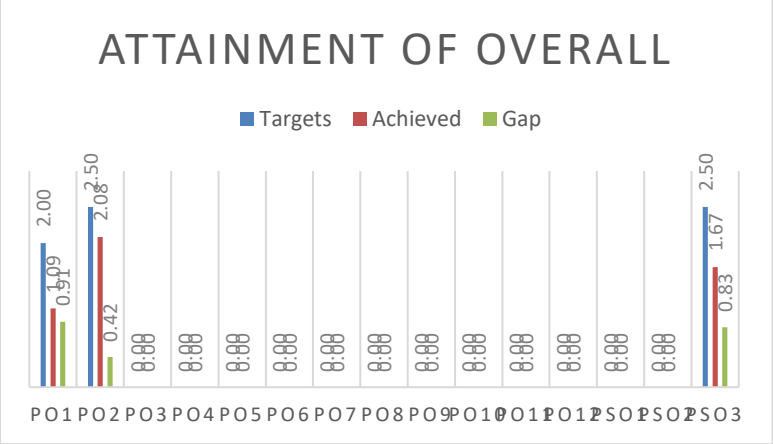

Gaps Identified:

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