

Ref No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY , BANGALORE-90



LABORATORY PLAN

Academic Year 2019-20

Program:	B E – Civil Engineering
Semester :	7
Course Code:	15CVL77
Course Title:	Computer Aided Detailing of Structures
Credit / L-T-P:	02 / 2-0-0
Total Contact Hours:	40
Course Plan Author:	MOHAN K T

Academic Evaluation and Monitoring Cell

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INSTRUCTIONS TO TEACHERS

- Classroom / Lab activity shall be started after taking attendance.
- Attendance shall only be signed in the classroom by students.
- Three hours attendance should be given to each Lab.
- Use only Blue or Black Pen to fill the attendance.
- Attendance shall be updated on-line & status discussed in DUGC.
- No attendance should be added to late comers.
- Modification of any attendance, over writings, etc is strictly prohibited.
- Updated register is to be brought to every academic review meeting as per the COE.

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Note : Remove "Table of Content" before including in CP Book

Each Laboratory Plan shall be printed and made into a book with cover page

Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. LABORATORY INFORMATION

1. Laboratory Overview

Degree:	B. E	Program	CIVIL
Year / Semester :	4 / 7th	Academic Year:	2019-20
Course Title:	Computer Aided Detailing of Structures	Course Code:	15CVL77
Credit / L-T-P:	02/ 2-0-0	SEE Duration:	180 Minutes
Total Contact Hours:	40 Hrs	SEE Marks:	80 Marks
CIA Marks:	20	Assignment	
Course Plan Author:	MOHAN K T	Sign	Dt :
Checked By:	SHIVAPRASAD D G	Sign	Dt :

2. Laboratory Content

Exp	Title of the Experiments	Lab Hours	Concept	Blooms Level
1	Detailing of RC simply supported beam, cantilever beam and continuous beam	03	Detailing	L6
2	Detailing of RC one way slab, two way and one-way continuous slab.	03	Detailing	L6
3	Detailing of RC Doglegged Staircase.	03	Detailing	L6
4	Detailing of RC Cantilever Retaining wall.	03	Detailing	L6
5	Detailing of RC Counter Fort Retaining wall.	03	Detailing	L6
6	Detailing of RC circular water tank and rectangular water tank.	03	Detailing	L6
7	Detailing of beam to beam beam to column by bolted and welded connections.	03	Detailing	L6
8	Detailing of Steel built-up columns with lacing's and battens.	03	Detailing	L6
9	Detailing of Steel column bases and gusseted bases with bolted and welded connections.	03	Detailing	L6
10	Detailing of Steel roof truss - welded and bolted.	03	Detailing	L6
11	Detailing of Steel beams with bolted and welded.	03	Detailing	L6
12	Detailing of Steel gantry girder.	03	Detailing	L6

3. Laboratory Material

Books & other material as recommended by university (A, B) and additional resources used by Laboratory teacher (C).

Expt.	Details	Expt. in book	Availability
A	Text books (Title, Authors, Edition, Publisher, Year.)	-	-
1-11	N Krishna Raju , "Structural Design and Drawing of Reinforced Concrete and Steel", University Press.	1-11	In Lib / In Dept
1-11	Krishna Murthy, "Structural Design and Drawing - Concrete Structures" , CBS Publishers, New Delhi.	1-11	In Lib/ In dept
B	Reference books (Title, Authors, Edition, Publisher, Year.)	-	-
1, 2	SP 34: Handbook on concrete reinforcement and detailing, Bureau of Indian Standards.	-	In Lib
1, 2	IS 13920:2016, Ductile design and detailing of reinforced concrete structures subjected to seismic forces - code of practice, Bureau of Indian Standard.	-	In Lib
3, 4, 5			
C	Concept Videos or Simulation for Understanding	-	-
c1			
c2			

D	Software Tools for Design	-	-
E	Recent Developments for Research	-	-
		-	-
F	Others (Web, Video, Simulation, Notes etc.)	-	-
1			

4. Laboratory Prerequisites:

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

Students must have learnt the following Courses / Topics with described Content . . .

SNo	Course Code	Base Course: Course Name	Topic / Description	Sem	Remarks
1	15CV51	Design of RCC Structural Elements	Analysis and Design concepts of RCC structural elements	5	
2	15CV62	Design of Steel Structures	Analysis and Design concepts of steel structural members.	6	
3	15CV54	Computer aided BPD	AUTO CAD Basic Commands.	5	

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.

Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Expt.	Topic / Description	Area	Remarks	Blooms Level
1	Compression, Tension, Torsion / Knowledge of Materials.	Higher Education.	Gap A seminar on Electron Tubes & amplifiers	Understand L2
3				
3				
5				
-				

B. Laboratory Instructions

1. General Instructions

SNo	Instructions	Remarks
1	Observation book and Lab record are compulsory.	
2	Students should report to the concerned lab as per the time table.	
3	After completion of the drawing, certification of the concerned staff in-charge in the observation book is necessary.	
4	Student should bring a notebook of 100 pages and should note the important shortcut of auto cad tools.	
5	The record of observations along with the detailed drawing in the immediate last session should be submitted and certified by staff member in-charge.	
6	Should attempt all drawing/ assignments given in the list session wise.	

7	It is responsibility to create a separate directory to store all the files, so that nobody else can read or copy.	
8	Completed lab assignments should be submitted in the form of a Lab Record in which you have to write the procedure along with drawings and results for various RCC and Steel structural members.	

2. Laboratory Specific Instructions

SNo	Specific Instructions	Remarks
1	Start computer	
2	Open the text editor	
3	Select new file.	
4	Write the program	
5	Save the program with .c extension.	
6	Compile the program Fg	
7	Execute the program F10	

C. OBE PARAMETERS

1. Laboratory Outcomes

#	COs	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
1	Preparing detailed working drawing of simply supported, cantilever and continuous beams.	03	Detailing	Demonstrate	Assignment	L6
2	Preparing detailed working drawing of one way, two way and one way continuous slabs	03	Detailing	Demonstrate	Assignment	L6
3	Preparing detailed working drawing of doglegged staircase.	03	Detailing	Demonstrate	Assignment and Slip Test	L6
4	Preparing detailed working drawing of cantilever retaining wall	03	Detailing	Demonstrate	Assignment	L6
5	Preparing detailed working drawing of counter fort retaining wall	03	Detailing	Demonstrate	Assignment	L6
6	Preparing detailed working drawing of circular and rectangular water tank.	03	Detailing	Demonstrate	Assignment	L6
7	Creating connections for beam to beam beam to column by bolted and welded connections	04	Detailing	Demonstrate	Assignment	L6
8	Creating lacing and battens for built up columns.	04	Detailing	Demonstrate	Assignment and Slip Test	L6
9	Creating gusseted bases and column bases for bolted and welded connections.	03	Detailing	Demonstrate	Assignment	L6
10	Creating roof truss for both bolted and welded connections.	03	Detailing	Demonstrate	Assignment	L6
11	Creating beams for bolted and welded connections	03	Detailing	Demonstrate	Assignment	L6
12	Preparing detailed working drawing of gantry girder for steel structural members.	03	Detailing	Demonstrate	Assignment	L6
-	Total	40	-	-	-	-

Note: Identify a max of 2 Concepts per unit. Write 1 CO per concept.

2. Laboratory Applications

SNo	Application Area	CO	Level
1	Design of simply supported, cantilever and continuous beams.	CO1	L6
2	Design of one way, two way and one way continuous slabs.	CO2	L6
3	Design of doglegged staircase.	CO3	L6
4	Design of cantilever retaining wall.	CO4	L6
5	Design of counter fort retaining wall.	CO5	L6
6	Design of circular and rectangular water tank.	CO6	L6
7	Creating connections for beam to beam beam to column by bolted and welded connections.	CO7	L6
8	Creating lacing and battens for built up columns.	CO8	L6
9	Creating gusseted bases and column bases for bolted and welded connections.	CO9	L6
10	Design of roof truss for both bolted and welded type.	CO10	L6
11	Creating beams with bolted and welded.	CO11	L6
12	Design of gantry girder for steel structural members.	CO12	L6

Note: Write 1 or 2 applications per CO.

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.

To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Mapping		Mapping Level	Justification
CO	PO	-	-
CO1	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of cantilever and simply supported beam.
CO1	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO1	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .
CO2	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of one way and two way slabs.
CO2	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO2	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .
CO3	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of Dog legged staircase..
CO3	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO3	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .
CO4	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of Cantilever retaining wall.
CO4	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO4	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .
CO5	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of counter fort retaining wall.
CO5	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO5	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .
CO6	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of circular and rectangular water tank.
CO6	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be

			provided in the given problem.
CO6	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .
CO7	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of column by bolted and welded connections.
CO7	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO7	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .
CO8	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of lacing and battens for built up columns.
CO8	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO8	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .
CO9	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of gusseted bases for built up column.
CO9	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO9	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .
CO10	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of roof truss for bolted and welded connections.
CO10	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO10	PO11	L6	Demonstrate knowledge of drafting and apply the concepts to make a plan and developing for the projects.
CO11	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing for beams bolted and welded connections.
CO11	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO11	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .
CO12	PO1	L6	Applying the knowledge of engineering science fundamental concepts to detailing of gantry girder for steel structural members.
CO12	PO2	L6	Civil engineering concepts to identify the type of reinforcement to be provided in the given problem.
CO12	PO11	L6	knowledge of drafting and apply the concepts to make a plans and projects .

4. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

#	Course Outcomes COs	Program Outcomes												Level	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
15CVL777.1	Preparing detailed working drawing of simply supported, cantilever and continuous beams.	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
15CVL777.2	Preparing detailed working drawing of one way, two way and one way continuous slabs	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
15CVL777.3	Preparing detailed working drawing of doglegged staircase.	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
15CVL777.4	Preparing detailed working drawing of cantilever retaining wall	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
15CVL777.5	Preparing detailed working drawing of counter fort retaining wall	2	3	-	-	-	-	-	-	-	-	-	3	-	L6

15CVL777.6	Preparing detailed working drawing of circular and rectangular water tank.	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
15CVL777.7	Creating connections for beam to beam beam to column by bolted and welded connections	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
15CVL777.8	Creating lacing and battens for built up columns.	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
15CVL777.9	Creating gusseted bases and column bases for bolted and welded connections.	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
15CVL777.10	Creating roof truss for both bolted and welded connections.	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
15CVL777.11	Creating beams for bolted and welded connections	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
15CVL777.12	Preparing detailed working drawing of gantry girder for steel structural members.	2	3	-	-	-	-	-	-	-	-	-	3	-	L6
CS501PC.	Average	2	3	-	-	-	-	-	-	-	-	-	3	-	

5. Curricular Gap and Experiments

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Expt	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					

Note: Write Gap topics from A.4 and add others also.

6. Experiments Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Expt	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

D. COURSE ASSESSMENT

1. Laboratory Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Unit	Title	Teaching Hours	No. of question in Exam							CO	Levels
			CIA-1	CIA-2	CIA-3	Asg-1	Asg-2	Asg-3	SEE		
1	Preparing detailed working drawing of simply supported, cantilever and continuous beams.	03	1	-	-	-	-	-	1	CO1	L6
2	Preparing detailed working drawing of one way, two way and one way continuous slabs	03	1	-	-	-	-	-	1	CO2	L6
3	Preparing detailed working drawing of doglegged staircase.	03	1	-	-	-	-	-	1	CO3	L6
4	Preparing detailed working drawing of cantilever retaining wall	03	1	-	-	-	-	-	1	CO4	L6
5	Preparing detailed working drawing of counter fort retaining wall	03	1	-	-	-	-	-	1	CO5	L6
6	Preparing detailed working drawing of circular and rectangular water tank.	03	1	-	-	-	-	-	1	CO6	L6
7	Creating connections for beam to beam beam to column by bolted and welded connections	03	1	-	-	-	-	-	1	CO7	L6
8	Creating lacing and battens for built up columns.	03	-	1	-	-	-	-	1	CO8	L6
9	Creating gusseted bases and column bases for bolted and welded connections.	03	-	1	-	-	-	-	1	CO9	L6
10	Creating roof truss for both bolted and welded connections.	03	-	1	-	-	-	-	1	CO10	L6
11	Creating beams for bolted and welded connections	03	-	1	-	-	-	-	1	CO11	L6
12	Preparing detailed working drawing of gantry girder for steel structural members.	03	-	1	-	-	-	-	1	CO12	L6
13	Total	40	7	5	-	-	-	-	20	-	-

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Evaluation	Weightage in Marks	CO	Levels
CIA Exam – 1	15	CO1, CO2, CO3, CO4	L5, L6
CIA Exam – 2	-	CO5, CO6, CO7,	L5, L6
CIA Exam – 3	-	CO8, CO9,CO10,CO11,CO12	L5, L6
Assignment - 1	05	CO1, CO2, CO3, CO4	L5, L6
Assignment - 2	-	CO5, CO6, CO7, CO8,	L5, L6
Assignment - 3	-	CO9,CO10,CO11,CO12	L5, L6
Seminar - 1	-		-
Seminar - 2	-		-
Seminar - 3	-		-
Other Activities – define – Slip test		CO1 to Co12	L5, L6

Final CIA Marks	20	-	-
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SNo	Description	Marks
1	Observation and Weekly Laboratory Activities	05 Marks
2	Record Writing	05 Marks for each Expt
3	Internal Exam Assessment	15 Marks
4	Internal Assessment	20 Marks
5	SEE	80 Marks
-	Total	100 Marks

E. EXPERIMENTS

Experiment 01 : Detailing of RC Beams

-	Experiment No.:	1	Marks	Date Planned	Date Conducted
1	Title	Detailing of simply supported, cantilever and continuous beams.			
2	Course Outcomes	Prepare detailed working drawing of simply supported, cantilever and continuous beams.			
3	Aim	Detailing of reinforced concrete beams			
4	Material / Equipment Required	Lab Manual			
5	Theory, Formula, Principle, Concept	Basic knowledge of design of beams			
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. By using the line command, the outline of the required drawing is drawn. By using the trim command, the extra lines are trimmed. Lines are extended using extend command wherever necessary. Donut option is used to represent the c/s of reinforcements. Offset command is used to get lines at regular distance. Hatching is done using hatch command. Dimensions are provided and text command is also used for labeling the drawing. 			
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph				
8	Observation Table, Look-up Table, Output				
9	Sample Calculations				
10	Graphs, Outputs				
11	Results & Analysis				
12	Application Areas	Design of beams			
13	Remarks				
14	Faculty Signature				

with Date	
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Experiment 02 : Detailing of RC Slabs

-	Experiment No.:	1	Marks	Date Planned	Date Conducted
1	Title	Detailing of one way, two way and one-way continuous slabs			
2	Course Outcomes	Prepare detailed working drawing of one way, two way and one-way continuous slabs.			
3	Aim	Detailing of reinforced concrete slabs			
4	Material Equipment Required	/ Lab Manual			
5	Theory, Formula, Principle, Concept	Basic knowledge of design of slabs			
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. By using the line command, the outline of the required drawing is drawn. By using the trim command, the extra lines are trimmed. Lines are extended using extend command wherever necessary. Donut option is used to represent the c/s of reinforcements. Offset command is used to get lines at regular distance. Hatching is done using hatch command. Dimensions are provided and text command is also used for labeling the drawing. 			
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph				
8	Observation Table, Look-up Table, Output				
9	Sample Calculations				
10	Graphs, Outputs				
11	Results & Analysis				
12	Application Areas	Design of slabs			
13	Remarks				
14	Faculty Signature with Date				

Experiment 03 : Detailing of RC Staircase

-	Experiment No.:	1	Marks	Date Planned	Date Conducted
1	Title	Detailing of doglegged staircase			
2	Course Outcomes	Prepare detailed working drawing of staircase			
3	Aim	Detailing of staircase			
4	Material Equipment Required	/ Lab Manual			

5	Theory, Formula, Principle, Concept	Basic knowledge of design of staircase
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. By using the line command, the outline of the required drawing is drawn. By using the trim command, the extra lines are trimmed. Lines are extended using extend command wherever necessary. Donut option is used to represent the c/s of reinforcements. Offset command is used to get lines at regular distance. Hatching is done using hatch command. Dimensions are provided and text command is also used for labeling the drawing.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	Design of staircase
13	Remarks	
14	Faculty Signature with Date	

Experiment 04 : Detailing of RC Cantilever retaining wall

-	Experiment No.:	1	Marks	Date Planned	Date Conducted	
1	Title	Detailing of cantilever retaining wall				
2	Course Outcomes	Prepare detailed working drawing of cantilever retaining wall				
3	Aim	Detailing of cantilever retaining wall				
4	Material Equipment Required	/Lab Manual				
5	Theory, Formula, Principle, Concept	Basic knowledge of design of retaining wall				
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. By using the line command, the outline of the required drawing is drawn. By using the trim command, the extra lines are trimmed. Lines are extended using extend command wherever necessary. Donut option is used to represent the c/s of reinforcements. 				

		<ul style="list-style-type: none"> Offset command is used to get lines at regular distance. Hatching is done using hatch command. Dimensions are provided and text command is also used for labeling the drawing.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	Design of retaining wall
13	Remarks	
14	Faculty Signature with Date	

Experiment 05 : Detailing of RC Counter fort retaining wall

-	Experiment No.:	1	Marks		Date Planned		Date Conducted	
1	Title	Detailing of counter fort retaining wall						
2	Course Outcomes	Prepare detailed working drawing of counter fort retaining wall						
3	Aim	Detailing of counter fort retaining wall						
4	Material Equipment Required	/Lab Manual						
5	Theory, Formula, Principle, Concept	Basic knowledge of design of retaining wall						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. By using the line command, the outline of the required drawing is drawn. By using the trim command, the extra lines are trimmed. Lines are extended using extend command wherever necessary. Donut option is used to represent the c/s of reinforcements. Offset command is used to get lines at regular distance. Hatching is done using hatch command. Dimensions are provided and text command is also used for labeling the drawing. 						
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph							
8	Observation Table, Look-up Table, Output							
9	Sample Calculations							

10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	Design of cantilever retaining wall
13	Remarks	
14	Faculty Signature with Date	

Experiment 06 : Detailing of RC Water tank

-	Experiment No.:	1	Marks		Date Planned		Date Conducted
1	Title	Detailing of rectangular and circular water tank					
2	Course Outcomes	Prepare detailed working drawing of rectangular and circular water tank					
3	Aim	Detailing of rectangular and circular water tank					
4	Material Equipment Required	/Lab Manual					
5	Theory, Formula, Principle, Concept	Basic knowledge of design of water tank					
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. By using the line command, the outline of the required drawing is drawn. By using the trim command, the extra lines are trimmed. Lines are extended using extend command wherever necessary. Donut option is used to represent the c/s of reinforcements. Offset command is used to get lines at regular distance. Hatching is done using hatch command. Dimensions are provided and text command is also used for labeling the drawing. 					
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph						
8	Observation Table, Look-up Table, Output						
9	Sample Calculations						
10	Graphs, Outputs						
11	Results & Analysis						
12	Application Areas	Design of water tank					
13	Remarks						
14	Faculty Signature with Date						

Experiment 07 : Detailing of steel structural members

-	Experiment No.:	1	Marks		Date Planned		Date Conducted
1	Title	Detailing of beam to beam beam to column by bolted and welded connections					
2	Course Outcomes	Prepare detailed working drawing of bolted and welded connections of beam to beam, beam to column sections.					

3	Aim	Detailing of beam to beam beam to column by bolted and welded connections
4	Material Equipment Required	/Lab Manual
5	Theory, Formula, Principle, Concept	Basic knowledge of design of bolted and welded connections of beams
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. By using the line command, the outline of the required drawing is drawn. By using the trim command, the extra lines are trimmed. Lines are extended using extend command wherever necessary. Donut option is used to represent the c/s of reinforcements. Offset command is used to get lines at regular distance. Hatching is done using hatch command. Dimensions are provided and text command is also used for labeling the drawing.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	Design of bolted and welded connections of beams and columns.
13	Remarks	
14	Faculty Signature with Date	

Experiment 08 : Detailing of steel lacings and battens

-	Experiment No.:	1	Marks	Date Planned	Date Conducted	
1	Title	Detailing of lacing and battens for built up columns.				
2	Course Outcomes	Prepare detailed working drawing of lacing and battens for built up columns				
3	Aim	Detailing of lacing and battens for built up columns.				
4	Material Equipment Required	/Lab Manual				
5	Theory, Formula, Principle, Concept	Basic knowledge of design of lacing and battens of steel built up columns.				
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. By using the line command, the outline of the required drawing is drawn. By using the trim command, the extra lines are trimmed. 				

		<ul style="list-style-type: none"> • Lines are extended using extend command wherever necessary. • Donut option is used to represent the c/s of reinforcements. • Offset command is used to get lines at regular distance. • Hatching is done using hatch command. • Dimensions are provided and text command is also used for labeling the drawing.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	Design of lacing and battens for built up sections.
13	Remarks	
14	Faculty Signature with Date	

Experiment 09 : Detailing of steel gusseted bases and column bases

-	Experiment No.:	1	Marks	Date Planned	Date Conducted	
1	Title	Detailing of gusseted bases and column bases for welded and bolted connections				
2	Course Outcomes	Prepare detailed working drawing of gusseted base and column base for welded and bolted connections.				
3	Aim	Detailing of gusseted bases and column bases for welded and bolted connections				
4	Material Equipment Required	/Lab Manual				
5	Theory, Formula, Principle, Concept	Basic knowledge of design of gusseted plate				
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> • The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. • By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. • Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. • By using the line command, the outline of the required drawing is drawn. • By using the trim command, the extra lines are trimmed. • Lines are extended using extend command wherever necessary. • Donut option is used to represent the c/s of reinforcements. • Offset command is used to get lines at regular distance. • Hatching is done using hatch command. • Dimensions are provided and text command is also used for labeling the drawing. 				
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph					

8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	Design of gusseted plate
13	Remarks	
14	Faculty Signature with Date	

Experiment 10 : Detailing of steel roof truss

-	Experiment No.:	1	Marks	Date Planned	Date Conducted	
1	Title	Detailing of roof truss for welded and bolted connections.				
2	Course Outcomes	Prepare detailed working drawing of roof truss.				
3	Aim	Detailing of roof truss for welded and bolted connections.				
4	Material Equipment Required	/Lab Manual				
5	Theory, Formula, Principle, Concept	Basic knowledge of design of roof truss.				
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. By using the line command, the outline of the required drawing is drawn. By using the trim command, the extra lines are trimmed. Lines are extended using extend command wherever necessary. Donut option is used to represent the c/s of reinforcements. Offset command is used to get lines at regular distance. Hatching is done using hatch command. Dimensions are provided and text command is also used for labeling the drawing. 				
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph					
8	Observation Table, Look-up Table, Output					
9	Sample Calculations					
10	Graphs, Outputs					
11	Results & Analysis					
12	Application Areas	Design of roof truss in steel structural members				
13	Remarks					
14	Faculty Signature with Date					

Experiment 11 : Detailing of steel beams with bolted and welded

-	Experiment No.:	1	Marks		Date Planned		Date Conducted	
1	Title	Detailing of beams with bolted and welded						
2	Course Outcomes	Prepare detailed working drawing of beams with bolted and welded						
3	Aim	Detailing of beams with bolted and welded						
4	Material Equipment Required	/Lab Manual						
5	Theory, Formula, Principle, Concept	Basic knowledge of design of bolted and welded beams.						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. By using the line command, the outline of the required drawing is drawn. By using the trim command, the extra lines are trimmed. Lines are extended using extend command wherever necessary. Donut option is used to represent the c/s of reinforcements. Offset command is used to get lines at regular distance. Hatching is done using hatch command. Dimensions are provided and text command is also used for labeling the drawing. 						
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph							
8	Observation Table, Look-up Table, Output							
9	Sample Calculations							
10	Graphs, Outputs							
11	Results & Analysis							
12	Application Areas	Design of beams with bolted and welded						
13	Remarks							
14	Faculty Signature with Date							

Experiment 12 : Detailing of steel gantry girder

-	Experiment No.:	1	Marks		Date Planned		Date Conducted	
1	Title	Detailing of gantry girder						
2	Course Outcomes	Prepare detailed working drawing of gantry girder						
3	Aim	Detailing of gantry girder						
4	Material Equipment Required	/Lab Manual						
5	Theory, Formula, Principle, Concept	Basic knowledge of design of gantry girder						
6	Procedure, Program, Activity, Algorithm, Pseudo	<ul style="list-style-type: none"> The limits are set before starting the drawing. The lower left corner is set as default (0.0000, 0.0000). The upper right corner is changed as per our requirements. 						

	Code	<ul style="list-style-type: none"> • By using units command, we set the types as decimal, precision as 0.0000 and units to scale as millimeters. • Ortho is switched off as the drawing requires use of inclined line also along with horizontal and vertical lines. • By using the line command, the outline of the required drawing is drawn. • By using the trim command, the extra lines are trimmed. • Lines are extended using extend command wherever necessary. • Donut option is used to represent the c/s of reinforcements. • Offset command is used to get lines at regular distance. • Hatching is done using hatch command. • Dimensions are provided and text command is also used for labeling the drawing.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	
12	Application Areas	Design of gantry girder
13	Remarks	
14	Faculty Signature with Date	

F. Content to Experiment Outcomes

1. TLPA Parameters

Table 1: TLPA – Example Course

Expt- #	Course Content or Syllabus (Split module content into 2 parts which have similar concepts)	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	B	C	D	E	F	G	H
1	Preparing detailed working drawing of simply supported, cantilever and continuous beams.	6	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
2	Preparing detailed working drawing of one way, two way and one way continuous slabs	6	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
3	Preparing detailed working drawing of doglegged staircase.	3	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
4	Preparing detailed working drawing of cantilever retaining wall	3	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
5	Preparing detailed working drawing of counter fort retaining wall	3	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
6	Preparing detailed working drawing of circular and rectangular water tank.	3	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
7	Creating connections for beam to beam beam to column by bolted and welded connections	3	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
8	Creating lacing and battens for built up columns.	3	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
9	Creating gusseted bases and column bases for bolted and welded connections.	3	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
10	Creating roof truss for both bolted and welded connections.	3	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
11	Creating beams for bolted and welded connections	3	L6	L6	Detail drafting.	PPT/ Lecture	Assignment
12	Preparing detailed working drawing of gantry girder for steel structural members.	3	L6	L6	Detail drafting.	PPT/ Lecture	Assignment

2. Concepts and Outcomes:

Table 2: Concept to Outcome – Example Course

Exp t- #	Learning or Outcome from study of the Content or Syllabus	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content / Syllabus. A short word for learning or outcome)	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology, 4.Benchmark)	Course Outcome Student Should be able to ...
A	I	J	K	L	M	N
1	Preparing detailed working drawing of simply supported, cantilever and continuous beams.	Detailing	Detailing	Detailed drawing for beams	Detailing/ Autocad/	Preparing detailed working drawing of simply supported, cantilever and continuous beams.
2	Preparing	Detailing	Detailing	Detailed drawing	Detailing/	Preparing detailed

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	detailed working drawing of one way, two way and one way continuous slabs			for slabs	Autocad/	working drawing of one way, two way and one way continuous slabs
3	Preparing detailed working drawing of doglegged staircase.	Detailing	Detailing	Detailed drawing for stair case.	Detailing/ Autocad/	Preparing detailed working drawing of doglegged staircase.
4	Preparing detailed working drawing of cantilever retaining wall	Detailing	Detailing	Detailed drawing for Retaining wall.	Detailing/ Autocad/	Preparing detailed working drawing of cantilever retaining wall
5	Preparing detailed working drawing of counter fort retaining wall	Detailing	Detailing	Detailed drawing for retaining wall.	Detailing/ Autocad/	Preparing detailed working drawing of counter fort retaining wall
6	Preparing detailed working drawing of circular and rectangular water tank.	Detailing	Detailing	Detailed drawing for water tank.	Detailing/ Autocad/	Preparing detailed working drawing of circular and rectangular water tank.
7	Creating connections for beam to beam beam to column by bolted and welded connections	Detailing	Detailing	Detailed drawing for steel connections.	Detailing/ Autocad/	Creating connections for beam to beam beam to column by bolted and welded connections
8	Creating lacing and battens for built up columns.	Detailing	Detailing	Detailed drawing for steel connections.	Detailing/ Autocad/	Creating lacing and battens for built up columns.
9	Creating gusseted bases and column bases for bolted and welded connections.	Detailing	Detailing	Detailed drawing for steel connections.	Detailing/ Autocad/	Creating gusseted bases and column bases for bolted and welded connections.
10	Creating roof truss for both bolted and welded connections.	Detailing	Detailing	Detailed drawing for steel connections.	Detailing/ Autocad/	Creating roof truss for both bolted and welded connections.
11	Creating	Detailing	Detailing	Detailed drawing	Detailing/	Creating beams for

	beams for bolted and welded connections			for steel connections.	Autocad/	bolted and welded connections
12	Preparing detailed working drawing of gantry girder for steel structural members.	Detailing	Detailing	Detailed drawing for steel connections.	Detailing/ Autocad/	Preparing detailed working drawing of gantry girder for steel structural members.