A NAAC Accredited Institution
KINGS
COLLEGE OF ENGINEERING
Recognized under 2(f) & 12(B) of UGC
Approved by AICTE, New Delhi
Affiliated to Anna University, Chennai

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DEPARTMENT OF CIVIL ENGINEERING

BRIDGE COURSE

STRUCTURAL DESIGN AND DRAWING

YEAR/SEMESTER: IV/07

ACADEMIC YEAR : 2022-2023 (ODD SEM)

PREPARED BY

Mr.R.RAMCHANDAR, AP/CIVIL

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DEPARTMENT OF CIVIL ENGINEERING

ACADEMIC YEAR 2022-23 (ODD)

Date: 22.07.2022

CIRCULAR

This is to inform, that our department is going to conduct a **bridge Course on STRUCTURAL DESIGN AND DRAWING** on this academic year 2022-2023 for final year, 7th semester students. All students are requested to enroll their name to Mr.R.Ramchandar AP/CIVIL on or before **29.07.2022.**

R. Ramchandar 22/07/22

Coordinator
(Mr.R.Ramchandar AP/CIVIL)

R. Saravanan 20/07/2022

HOD/CIVIL
(DR.R.SARAVANAN)

SYLLABUS
STRUCTURAL DESIGN AND DRAWING

OBJECTIVES:

- The course aims at providing students with a solid background on the principles of structural engineering design.
- Students will be acquire the knowledge of liquid retaining structures, retaining wall and industrial structures.

UNIT -I RETAINING WALLS 6

Reinforced concrete Cantilever Retaining Walls–Horizontal Backfill with Surcharge–Design of Shear Key-Design and Drawing.

UNIT-II FLAT SLAB AND BRIDGES 6

Design of Flat Slabs with and without drops by Direct Design Method of IS code- Design and Drawing - IRC Specifications and Loading.

UNIT-III LIQUID STORAGE STRUCTURES 6

RCC Water Tanks - On ground - Design and Drawing

UNIT-IV INDUSTRIAL STRUCTURES 6

Structural steel Framing - Steel Roof Trusses

UNIT-V GIRDERS AND CONNECTIONS 6

Plate Girders – Behaviour of Components

TOTAL: 30 PERIODS

COURSE OUTCOME

At the end of the course, the students will be able to

- Design and draw reinforced concrete Cantilever Retaining Walls
- Design and draw flat slab as per code provisions
- Design and draw reinforced concrete Water tanks
- Gain knowledge on Structural steel Framing
- Gain knowledge on Deign of Plate Girder

R. Ramchandar 22/7/22

STAFF INCHARGE
(Mr.R.RAMCHANDAR)

R. Saravanan 22/07/2022

HOD/CIVIL
(Dr.R.SARAVANAN)

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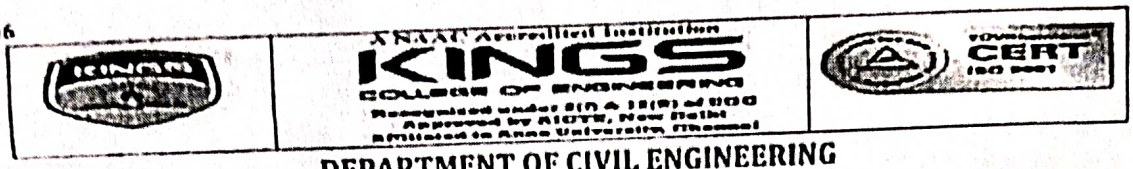


DEPARTMENT OF CIVIL ENGINEERING

SPECIAL TIME TABLE (1.8.2022 - 6.8.2022,ODD SEM)

B.E – CIVIL (Regulation 2017) - With Effect from 1.8.2022

Batch:2019 - 2023 | Strength:20

Year: IV | Semester: VII | Class Room : 233 | Block: II

Session	1	2	10.45 am - 11.00 am	3	4	12.30 pm - 01.10 pm	5	6	02.40 pm - 02.50 pm	7	8
Day	09.15am - 10.00am	10.00am - 10.45am		11.00am - 11.45am	11.45am - 12.30pm		01.10pm - 01.55pm	01.55pm - 02.40pm		02.50pm - 03.35pm	03.35pm - 04.20pm
MON	Orientation		BREAK	CC		LUNCH BREAK	COMM.SKILL		BREAK	BC	
TUE	RFC			CC			COMM.SKILL			BC	
WED	RFC			CC			COMM.SKILL			BC	
THU	T&P(SS)	T&P(A)		CC			COMM.SKILL			BC	
FRI	RFC			CC			COMM.SKILL			BC	
SAT	RFC			CC			COMM.SKILL			BC	

SUB CODE	NAME OF THE SUBJECT	CREDITS	NAME OF THE STAFF	DEPT	PERIODS/WEEK
VALUE ADDITION INTIATIVES (VAI)					
Orientation	Orientation Program	-	Mr.K.Arun	CIVIL	2
COMM.SKILL	Communication Skill	-	Mr.D.Dinesh	ENGLISH	12
BC	Bridge Course	-	Mr.R.Ramchandar	CIVIL	12
RFC	Refresher Course	-	Ms.S.Gayathri	CIVIL	08
T&P (A)	Training & Placement - Aptitude	-	Ms.P.Suganya	T&P	1
T&P(SS)	Training & Placement - Softskill		Dr.K.Sudhakar	T&P	1
CC	Certification Course - Sketchup	-	Mr.R.Chandrasekar	CIVIL	12

CLASS CO-ORDINATOR	NAME OF THE REPRESENTATIVES	ROLL NO
Mr.K.Arun	B.Agalya M.Jayaseelan	01 08

VALUE ADDITION INTIATIVES (VAI) - REGULAR HOURS					
LIB/NET	Library / Internet	VAI	Mr.K.Arun	CIVIL	1
NPTEL	NPTEL Swayam Courses	VAI	Mr.K.Arun	CIVIL	1
RC	Refresher Course	VAI	Ms.S.Gayathri	CIVIL	2
T&P (A)	Training & Placement - Aptitude	VAI	Ms.P.Suganya	T&P	1
T&P(SS)	Training & Placement - Softskill	VAI	Dr.K.Sudhakar	T&P	1

DEPT. TTC

HOD 30/07/2022

PRINCIPAL 30/7/2022

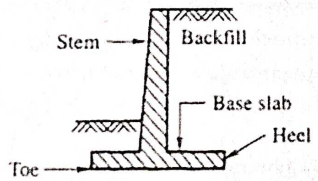
STRUCTURAL DESIGN AND DRAWING

CANTILEVER RETAINING WALL

Cantilever retaining wall:

Cantilever retaining walls are constructed of reinforced concrete. They consist of a relatively thin stem and a base slab. The base is also divided into two parts, the heel and toe. The heel is the part of the base under the backfill. The toe is the other part of the base.

Parts of cantilever retaining wall:



Why use a cantilever wall instead of gravity?

Cantilevered retaining walls use much less material than a traditional gravity walls. The retaining wall operates like a beam, cantilevering the load to a large, fixed structural base, and converting horizontal pressures from behind the wall into vertical pressures on the ground below.

Maximum height for cantilever retaining wall:

Cantilever retaining walls are found best up to a height of **6m**. For greater heights earth pressure due to retained fill will be higher due to lever arm effect, higher moments are produced at base, which leads to higher section for stability design as well as structural design.

Design procedure :

1. Dimension Calculation
2. Design of stem
3. Stability calculation
4. Design of Toe slab
5. Design of heel slab
6. Check factor of safety against sliding
7. Design of shear key as per check
8. Reinforcement detailing

Step 1: Dimension Calculation

a) Depth of foundation

$d = \frac{q}{\gamma_1}\left(\frac{1-\sin\phi}{1+\sin\phi}\right)^2$

b) Overall depth of wall

H= Height above GL + Depth of foundation

c) Thickness of base slab

t= H/12

d) Height of the stem

h= H - H/12

e) Width of base slab

b= 0.5H - 0.6H

Step 2: Design of stem

a)Maximum bending moment at base

$M = K_a\left(\frac{\gamma h^3}{2}\right)$

b)Effective depth required

Mu= 0.138*fck*bd^2

c)Find Ast(main reinforcement)

Mu= (0.87*fy*Ast*d) [(1-Ast*fy)/(b*d*fck)]

d)Find spacing : Spacing = 1000*(ast/Ast)

e)Distribution reinforcement : Ast(dist) = (0.12% of b*d)

f)Find spacing : Spacing = 1000*(ast/Ast)

Step 3: Stability calculation

a) Find load

W= Area*Density

a) Find moment

M= w*length

c) Point of application at a

$z = \frac{\Sigma M}{\Sigma W}$

d) Eccentricity

e= (z-b/2)

Maximum and minimum pressure at base:

- Maximum pressure at toe
- Maximum pressure at heel

Step 4: Design of heel slab

a) Find load

W= Area * Density

a) Find moment

M= w*length

a) Deduction

1) Upward pressure 'abjh'

2) Upward pressure 'ghj'

3)Moment Deduction 'abjh'

4)Moment Deduction 'ghj'

d) Max. Service BM in heel slab

M= M-Md

e) Factored moment

Mu= M*1.5

f) Find Ast

Mu= (0.87*fy*Ast*d) [(1-Ast*fy)/(b*d*fck)]

g) Find spacing

Spacing = 1000*(ast/Ast)

h) Distribution reinforcement

Ast(dist) = (0.12% of b*d)

i) Find spacing

Spacing = 1000*(ast/Ast)

Step 5: Design of toe slab

a) Find load

W= Area * Density

a) Find moment

M= w*length

a) Deduction

1) Upward pressure 'abjh'

2) Upward pressure 'ghj'

3)Moment Deduction 'abjh'

4)Moment Deduction 'ghj'

d) Max. Service BM in heel slab

M= M-Md

e) Factored moment

Mu= M*1.5

f) Find Ast

Mu= (0.87*fy*Ast*d) [(1-Ast*fy)/(b*d*fck)]

g) Find spacing

Spacing = 1000*(ast/Ast)

h) Distribution reinforcement

Ast(dist) = (0.12% of b*d)

i) Find spacing

Spacing = 1000*(ast/Ast)

Step 6: Factor of safety against sliding

check

$$P = K_a \cdot \frac{wH^2}{2}$$

Step 7: Design of shear key

Passive pressure = $K_p \times P$

$K_p = 1/K_a = 2$

Total passive pressure $P_p = P_p \cdot a$

Shear stress at function

$$\tau_v = \frac{V_u}{bd}$$

$V_u = V \times 1.5$

$V = (1.5 \Sigma F - \mu w)$

$\tau_c > \tau_v$ Safe

Step 8: Reinforcement details

Thank you

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ACADEMIC YEAR 2022-23 (ODD SEM)

Bridge course - STRUCTURAL DESIGN AND DRAWING

STUDENTS ENROLLMENT

IV YEAR CIVIL / 07 SEM

S.No.	Reg. Number	Student Name	Students Signature
1	821119103001	AGALYA B	B. Agalya
2	821119103002	ANBUMANI S	S. Anbumani
3	821119103003	ARUNKUMAR M	M. Arunkumar
4	821119103004	ARUNPRASAD S	S. Arun.
5	821119103005	DIVYA S	S. Divya
6	821119103006	JANANI T S	T.S. Janani
7	821119103007	JAYACHANDRAN N	N. Jayachandran
8	821119103008	JAYASEELAN M	M. Jayaseelan
9	821119103010	KURALARASAN R	R. Kuralarasan
10	821119103011	MADHUMITHA R	R. Madhumitha
11	821119103012	MONIKA M	M. Monika
12	821119103013	PREMKUMAR J	J. Premkumar
13	821119103014	RENGESWARI R	R. Rengeswari
14	821119103015	RUBIKA M	M. Rubika
15	821119103016	SANTHOSH S	S. Santhosh
16	821119103017	SATHYA P	Sathya P.
17	821119103018	STALIN P	P. Stalin.
18	821119103019	VIMAL R	R. Vimal
19	821119103301	DANIEL NAVIS F	F. Daniel Navis
20	821119103501	KARTHIKEYAN	R. Karthikeyan.
21		ABIRAMI. S	S. Abirami

R. Ramchandar 1/8/22
SUBJECT INCHARGE

R. Saravanan 01/08/2022
HOD/CIVIL

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DEPARTMENT OF CIVIL ENGINEERING
ACADEMIC YEAR 2022-23 (ODD SEM)
IV YEAR CIVIL / 07 SEM
BRIDGE COURSE ON "STRUCTURAL DESIGN AND DRAWING" - ATTENDANCE REPORT

S.No.	Reg. Number	Student Name	1/8/22	2/8/22	3/8/22	4/8/22	5/8/22	6/8/22	8/8/22	8/8/22	9/8/22	12/8/22	14/8/22	20/8/22	21/8/22	27/8/22	28/8/22
			7, 8	7, 8	7, 8	7, 8	7, 8	7, 8	1, 2	3	1, 23	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2
1	821119103001	AGALYA B	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
2	821119103002	ANBUMANI S	A	/	/	/	/	/	/	/	A	/	/	/	/	/	/
3	821119103003	ARUNKUMAR M	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/
4	821119103004	ARUNPRASAD S	A	/	/	/	/	/	/	/	/	/	/	/	/	/	/
5	821119103005	DIVYA S	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/
6	821119103006	JANANI T S	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
7	821119103007	JAYACHANDRAN N	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/
8	821119103008	JAYASEELAN M	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/
9	821119103010	KURALARASAN R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
10	821119103011	MADHUMITHA R	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/
11	821119103012	MONIKA M	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
12	821119103013	PREMKUMAR J	/	/	A	/	/	/	/	/	/	/	/	/	A	/	A
13	821119103014	RENGESWARI R	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/
14	821119103015	RUBIKA M	/	/	/	/	/	A	/	/	/	/	A	/	/	/	/
15	821119103016	SANTHOSH S	A	/	/	/	/	/	/	/	/	/	/	/	/	/	/
16	821119103017	SATHYA P	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
17	821119103018	STALIN P	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/
18	821119103019	VIMAL R	A	/	/	/	/	/	/	/	A	/	/	/	/	/	A
19	821119103301	DANIEL NAVIS F	A	/	/	/	/	A	A	A	/	/	/	/	/	/	/
20	821119103501	KARTHIKEYAN R	/	/	/	/	/	/	/	/	/	/	/	/	/	A	A
21		ABIRAMI S	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
TOTAL STUDENTS			21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
PRESENT			16	21	20	21	20	17	20	18	17	21	20	21	20	20	18
ABSENT			05	-	01	-	01	04	01	03	04	-	01	-	01	01	03
COURSE INCHARGE SIGN																	

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ACADEMIC YEAR 2022-23 (ODD SEM)

BRIDGE COURSE ON "STRUCTURAL DESIGN AND DRAWING"

ASSESSMENT MARKS

IV YEAR CIVIL / 07 SEM

S.No.	Reg. Number	Student Name	Total Marks (50)
1	821119103001	AGALYA B	46
2	821119103002	ANBUMANI S	36
3	821119103003	ARUNKUMAR M	37
4	821119103004	ARUNPRASAD S	38
5	821119103005	DIVYA S	45
6	821119103006	JANANI T S	40
7	821119103007	JAYACHANDRAN N	36
8	821119103008	JAYASEELAN M	42
9	821119103010	KURALARASAN R	45
10	821119103011	MADHUMITHA R	44
11	821119103012	MONIKA M	40
12	821119103013	PREMKUMAR J	38
13	821119103014	RENGESWARI R	42
14	821119103015	RUBIKA M	40
15	821119103016	SANTHOSH S	38
16	821119103017	SATHYA P	44
17	821119103018	STALIN P	46
18	821119103019	VIMAL R	40
19	821119103301	DANIEL NAVIS F	36
20	821119103501	KARTHIKEYAN R	38
21		ABIRAMI	45

R. Ramchandar 30/8/22

COURSE INCHARGE
(Mr.R.RAMCHANDAR)

R. Saravanan 30/08/2022

HOD/CIVIL
(DR.R.SARAVANAN)

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Punalkulam, Near Thanjavur, Pudukkottai Dt - 613303

DEPARTMENT OF CIVIL ENGINEERING

CERTIFICATE OF PARTICIPATION

This is to certify that Mr./Ms. **S.DIVYA** of **IV YR** Civil Engineering has completed **BRIDGE COURSE** in the topic **STRUCTURAL DESIGN AND DRAWING** organized by the Department of Civil Engineering, Kings College of Engineering, Thanjavur, during **AUGUST 2022**.

Mr.R.RAMCHANDAR COURSE INCHARGE	Dr.R.SARAVANAN HOD/CIVIL	Dr.J.ARPUTHA VIJAYA SELVI PRINCIPAL

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CERTIFICATE OF PARTICIPATION

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R. Ramchandar	R. Saravanan	J. Arputha
Mr.R.RAMCHANDAR	**Dr.R.SARAVANAN**	**Dr.J.ARPUTHA VIJAYA SELVI**
COURSE INCHARGE	HOD/CIVIL	PRINCIPAL