STRUCTURAL DESIGN Lab

(GR20D5009)

I - M.Tech - I Semester

Mr. C Vanadeep & Mr. C Vivek Kumar

Assistant Professors

Department of Civil Engineering

Gokaraju Rangaraju Institute of Engineering and Technology

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

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

STRUCTURAL DESIGN Lab

Course File Check List

S.No.	Name of the Format	Page No.
1	Syllabus	
2	Time Table	
3	Program Educational Objectives	
4	Program Objectives	
5	Course Objectives	
6	Course Outcomes	
7	Students Roll List	
8	Guide lines to study the course books & references, course design & delivery	
9	Course Schedule	
10	Unit Plan/Course Plan	
11	Evaluation Strategy	
12	Assessment in relation to COB's and CO's	
13	Tutorial Sheets	
14	Assignment Sheets	
15	Rubric for course	
16	Mappings of CO's and PO's	
17	Model question papers	
18	Mid-I and Mid-II question papers	
19	Mid-I marks	
20	Mid-II marks	
21	Sample answer scripts and Assignments	
22	Course materials like Notes, PPT's, Videos, etc.	

GR 18 Regulations (2021-2022)

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

I Year M. Tech. STE – I Semester	**L**	**T/P/D**	**C**
	0	**-/2/-**	**2**

(GR20D5009) STRUCTURAL DESIGN LAB

Cycle I

1. Analysis and Design of plane frame using ETABS
2. Analysis and Design of truss using ETABS
3. Design of continuous beam using MS Excel/ ETABS
4. Design of columns using MS Excel/ ETABS
5. Design of one-way Slab using MS Excel

Cycle II

6. Design of two-way Slab using MS Excel
7. Analysis of Bridge Deck slab
8. Design of Combined Footing using MS Excel
9. Analysis of Multi storyed space frame using ETABS
10. Analysis of Retaining wall using MS Excel/ETABS

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)
Bachupally, Hyderabad-500090

DEPARTMENT OF CIVIL ENGINEERING (M.Tech)

I YEAR **ROOM NO: 4207** **W.E.F: 15-11-2021**

	1	2	3	4	8	9	10
	9:00-10:00	10:00-11:00	11:00-12:00	12:00-1:00	1:00-2:00	2:00-3:00	3:00-4:00
Monday				LUNCH BREAK	SD Lab		
Tuesday							
Wednesday							
Thursday					SD Lab		
Friday							
Saturday							

CODE	Subject	Faculty
GR20D5009	STRUCTURAL DESIGN Lab	Mr. C Vanadeep / Mr. C Vivek Kumar

CLASS COORDINATOR **PROGRAMME COORDINATOR** **HOD**

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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

Program Educational Objectives

PEO 1: Graduates of the program will equip with professional expertise on the theories, process, methods and techniques for building high-quality structures in a cost-effective manner**.**

PEO 2: Graduates of the program will be able to design structural components using contempory soft wares and professional tools with quality practices of international standards.

PEO 3: Graduates of the program will be effective as both an individual contributor and a member of a development team with professional, ethical and social responsibilities.

PEO 4: Graduates of the program will grow professionally through continuing education, training, research, and adapting to the rapidly changing technological trends globally in structural engineering.

Program Outcomes

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

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

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

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

PO 5:. Possess critical thinking skills and solve core, complex and multidisciplinary structural engineering problems.

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

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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

COURSE OBJECTIVES

Academic Year : 2021-2022

Semester : I

Name of the Program: M. Tech **Year:** I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Dept.:** Civil Engineering

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

1.	To learn the software applications in structural engineering.
2.	To learn the analysis of plane, space truss and frames subjected to different types of loadings.
3.	To draw the detailing of RCC members and to learn the estimations.
4.	To study the design concepts of steel members like truss, beams and columns.
5	To study design requirements for RCC retaining walls.

Signature of HOD Signature of faculty

Date: Date:

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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

COURSE OUTCOMES

Academic Year : 2021-2022

Semester : I

Name of the Program: M.Tech **Year:** I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Dept.:** Civil Engineering

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

	Outcomes
1	Understand the software usages and produce structural drawing for structural members.
2	Design and analyze plane frame and truss subjected to different type of loading
3	Design, detailing and estimations of RC structural members like beam, column, slab, and Footing
4	Design and analysis of bridge deck slab for different loading conditions
5	Design and analysis of retaining wall for different loading conditions.

Signature of HOD Signature of faculty

Date: Date:

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

S.No	ROLL NUMBER	NAME OF THE STUDENT
1	20241D2001	ATKAPURAM PRASHANTH
2	20241D2002	BANDI SRI RAM GOPAL
3	20241D2003	CHALLA MADHAVI
4	20241D2004	PAMMI DIVYA
5	20241D2005	DUMMA UMESH KUMAR
6	20241D2006	K LATHASREE
7	20241D2007	MARIYALA VAISHNAVI
8	20241D2008	MAVOORI PRANAV
9	20241D2009	MITTAPALLI NAGA ASHWINI
10	20241D2010	RAVULA VENKATA SURAJ REDDY
11	20241D2011	REPATI MOHAN BABU
12	20241D2012	SANDHYA CHERUKU
13	20241D2013	SHAIK FEROZ
14	20241D2014	SK SAI CHANDRA
15	20241D2015	THOTA HARSHAVARDHAN
16	20241D2016	VARIKUPPALA LALITHA
17	20241D2017	YAMBA RAMA GNANENDRA SAI
18	20241D2018	YENUMALA DEVESH GOUD
19	20241D2019	S PRASHANTH KUMAR
20	20241D2020	BAVANDLAPELLI THARUN TEJA
21	20241D2021	G NITISH KUMAR

Signature of HOD

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

GUIDELINES TO STUDY THE COURSE SUBJECT

Academic Year :	2021-2022	**Semester** :	I
Name of the Program:	M.Tech	**Year** :	I Year
Course/Subject :	Structural Design Lab	**Course Code** :	GR20D5009
Name of the Faculty :	Mr. C Vanadeep / Mr. C Vivek Kumar		
Designation:	Assistant Professor		

Guidelines to study the course/subject: Structural Design Lab

This course helps the students to learn and understand the concepts of reinforced cement concrete design for structural members like slabs, beams, columns, and footings along with the skills of modeling and analyzing using a MS Excel and an advanced software like ETABS. This also extends to Deck slab bridge design and retaining wall.

So, the students should have the following prerequisites:

- Basic Knowledge in Mathematics
- Good knowledge of Reinforced Concrete Design
- Ability to perform exercise as well as analyze and interpret data.

Where will this subject help?

1. Structural Design Lab helps apply design and analysis concepts using industry software like ETABS
2. To gain knowledge in analysis and design of advanced structures.
3. To develop a ready to access excel files for all basic structural elements

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

BOOKS AND MATERIALS

TEXT BOOKS

1. Reinforced Concrete Design, Pillai S. U. and Menon D., Tata McGraw-Hill, 3rd Ed, 1999
2. Illusrate Reinforced Concrete Design, Shah & Karve
3. Advanced Reinforced Concrete Design, Varghese P. C., Prentice Hall of India, New Delhi.

Suggested / Reference Books	
1.	IS 456-2000; Indian Standard Code of Practice for Plain and Reinforced Concrete.
2.	SP 16: Design Aids for Reinforced Concrete
3.	User's Guide ETABS® 2016 Integrated Building Design Software

Web Sites	
1.	**https://standardsbis.bsbedge.com/**
2.	**https://wiki.csiamerica.com/display/doc/ETABS+Training+manuals**
3.	**https://www.youtube.com/watch?v=mTLmMwKvukw&list=PLELbBNWxxKaCAJL_RKmSwjUlkVRgCway9**

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

COURSE DESIGN AND DELIVERY SYSTEM (CDD)

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

The faculty be able to –

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

Signature of HOD

Date:

Signature of faculty

Date:

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

COURSE SCHEDULE

Academic Year : 2021-2022

Semester : I

Name of the Program: M.Tech **Year:** I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor

The Schedule for the whole Course / Subject is:

S.NO	DESCRIPTION	DATE		NO. OF CLASSES
		FROM	TO	
1	Instructions and Demonstration	15-11-2021	18-11-2021	1 Day
2	Cycle -I	22-11-2021	28-01-2021	7 Weeks
3	Cycle – II	03-02-2022	03-03-2022	7 Weeks
4	Revision	07-03-2022	10-03-2022	1 Week
5	Practical Examination	17-03-2022	17-03-2022	1 Week
6	End Examination	20-03-2022	20-03-2022	1 Week

Total No. of Instructional periods available for the course: **50** Hours / Periods

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

STRUCTURAL ENGINEERING LAB

CYCLE -1 EXERCISES RELATED BUILDING STRUCTURAL ELEMENTS

1. Analysis and Design of plane frame using ETABS
2. Analysis and Design of truss using ETABS
3. Design of continuous beam using MS Excel/ ETABS
4. Design of columns using MS Excel/ ETABS
5. Design of one way Slab using MS Excel
6. Design of two way Slab using MS Excel

CYCLE -2 EXERCISES RELATED TO ADVANCED STRUCTURES

7. Analysis of Bridge Deck slab
8. Design of Combined Footing using MS Excel
9. Analysis of Multi storyed space frame using ETABS
10. Analysis of Retaining wall using MS Excel/ETABS

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

Academic Year : 2021-2022

Semester : I

Name of the Program: M.Tech **Year:** I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor

The Course plan for the whole Course / Subject is:

Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	
1.	11/15/2021	3	Introduction of RC design & IS code	CO- 1-5	COB- 1-5
2.	11/18/2021	3	Design of all the Structural Components of Frame Buildings manually	CO- 3	COB- 3
3.	11/22/2021	3	Design of all the Structural Components of Frame Buildings Excel	CO- 1, 3	COB- 1, 3
4.	11/25/2021	3	Design of all the Structural Components of Frame Buildings manually	CO- 3	COB- 3
5.	11/29/2021	3	Design of all the Structural Components of Frame Buildings Excel	CO- 1, 3	COB- 1, 3
6.	12/2/2021	3	Design of all the Structural Components of Frame Buildings manually	CO- 3	COB- 3
7.	12/6/2021	3	Design of all the Structural Components of Frame Buildings Excel	CO- 1, 3	COB- 1, 3
8.	12/9/2021	3	Design of all the Structural Components of Frame Buildings manually	CO- 3	COB- 3
9.	12/13/2021	3	Design of all the Structural Components of Frame Buildings Excel	CO- 1, 3	COB- 1, 3
10.	12/20/2021	3	Design of all the Structural Components of Frame Buildings manually	CO- 3	COB- 3
11.	12/23/2021	3	Design of all the Structural Components of Frame Buildings Excel	CO- 1, 3	COB- 1, 3

12.	12/27/2021	3	Introduction of Design Software	CO- 1-5	COB- 1-5
13.	1/3/2022	3	Modelling of Building using Software	CO- 1-3	COB- 1-4
14.	1/21/2022	3	Modelling of Building using Software	CO- 1-3	COB- 1-4
15	1/22/2022	3	Modelling of Building using Software	CO- 1-3	COB- 1-4
16	1/28/2022	3	Analysis of G+3 storey building using Software	CO- 1 & 3	COB- 1 – 4
17	2/3/2022	3	Analysis of G+3 storey building using Software	CO- 1 & 3	COB- 1 – 4
18	2/7/2022	3	Design of G+3 storey building using Software	CO- 1 & 3	COB- 1 – 4
19	2/10/2022	3	Design of G+3 storey building using Software	CO- 1 & 3	COB- 1 – 4
20	2/14/2022	3	Design of G+3 storey building using Software	CO- 1 & 3	COB- 1 – 4
21	2/21/2022	3	Practice on Structural design software	CO- 1 – 5	COB- 1-5
22	2/24/2022	3	Practice on Structural design software	CO- 1 – 5	COB- 1-5
23	2/28/2022	3	Design of all the Structural Components of Retaining Wall	CO- 4	COB- 4
24	3/3/2022	3	Design of all the Structural Components of Retaining Wall (Excel)	CO- 1 & 4	COB- 1 & 5
25	3/7/2022	3	Analysis of Bridge Deck slab	CO- 1 & 5	COB- 1

Signature of HOD
Date:

Signature of faculty
Date:

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year	:	2021-2022	**Semester**	:	I
Name of the Program:		M.Tech	**Year**	:	I Year
Course/Subject	:	Structural Design Lab	**Course Code**	:	GR20D5009
Name of the Faculty	:	Mr. C Vanadeep / Mr. C Vivek Kumar			
Designation: Assistant Professor			**Department**: Civil Engineering		
Lesson No: 1			**Duration of Lesson:** 3 hrs		

Lesson Title: Introduction of RC design & IS code

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Understand the RC design basics & usage of IS code

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Structural Elements
Introduction of RC design
Usage of IS code

Assignment Questions:

1. Write down the codes for design of RCC Building Structural Elements (CO1, COB1)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 2 **Duration of Lesson:** 3 hrs

Lesson Title: Design of all the Structural Components of Frame Buildings

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Design of a structural member: Beam (Manually)
2. Use IS 456 to design and perform checks involved in design
3. Design for shear reinforcements in beam

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Beam Design: Reinforcements for target moment (for singly and doubly reinforced scenarios)
Shear design in beams
Using IS Codes

Assignment / Questions:

1. Determining moment carrying capacity of a structural member: Beam (CO1, COB1)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 3 **Duration of Lesson:** 3 hrs

Lesson Title: Design of all the Structural Components of Frame Buildings (MS Excel)

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Designing of beam using Excel
2. Design for shear reinforcements in beam in Excel

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Beam Design: Steps involved in Excel

Shear design in beams Steps involved in Excel

Assignment / Questions:

1. Excel file for Cantilever beam (CO1, COB1)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 4 **Duration of Lesson:** 3 hrs

Lesson Title: Design of all the Structural Components of Frame Buildings (Manually)

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Design of a structural member: One-way Slabs (Manually)
2. Use IS 456 to design and perform checks involved in design

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Slab Design: Reinforcements for target moment (one way)

Taking loads from IS 875

Using IS Codes in design

Assignment / Questions:

1. Calculate the live loads from IS 875 - Part II for different buildings (CO2, COB2)
2. Calculate the total ultimate load for those conditions for the given slab (CO2, COB2)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 5 **Duration of Lesson:** 3 hrs

Lesson Title: Design of all the Structural Components of Frame Buildings (MS Excel)

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Design of a structural member: One-way Slabs in Excel

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Slab Design: using Excel (One way slab)

Assignment / Questions:

1. Interpolation excel files for increasing and decreasing data (CO2, COB2)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 6 **Duration of Lesson:** 3 hrs

Lesson Title: Design of all the Structural Components of Frame Buildings (Manually)

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Design of a structural member: Two-way Slabs (Manually)
2. Use IS 456 to design and perform checks involved in design

TEACHING AIDS : Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS :

Slab Design: Reinforcements for target moment (two way)

Load distribution from slabs to beams

Using IS Codes

Assignment / Questions:

1. Load Distribution from two way slab onto the beams (CO2, COB2)
2. Load Distribution from one way slab onto its longer beams (CO2, COB2)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 7 **Duration of Lesson:** 3 hrs

Lesson Title: Design of all the Structural Components of Frame Buildings (MS Excel)

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Design of a structural member: Slabs (MS Excel)

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Slab Design: using Excel (Two way slab)

Assignment / Questions:

1. Cantilever Slab design in MS Excel (CO2, COB2)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 8 & 9 **Duration of Lesson:** 3 hrs

Lesson Title: Design of all the Structural Components of Frame Buildings (Manual and Excel)

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Design of a structural member: Columns (Manually)
2. Use SP 16 to get % steel from Moment and Axial Loads
3. Design column loaded with biaxial action in MS Excel

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Column Design: Using IS Codes in biaxial bending column design

Extracting % steel from SP 16

Creating an Excel File for a column (biaxial) design in MS Excel

Assignment / Questions:

1. Capacity of a given column (CO2, COB2)
2. Effective lengths of various end conditions for columns (CO2, COB2)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 10 & 11 **Duration of Lesson:** 3 hrs

Lesson Title: Design of all the Structural Components of Frame Buildings (Manual and Excel)

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Design of Footing (combined)
2. Design Footing in MS Excel

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Footing Design: Reinforcements for target strength

Various shear failure cases

Creating an Excel File for a Footing Design in MS Excel

Assignment / Questions:

1. Differences between combined footing and isolated footing (CO3, COB3)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 12 **Duration of Lesson:** 3 hrs

Lesson Title: Introduction of Design Software

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Understand the interface of ETABS software

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

ETABS user interface

ETABS coordinate system

Assignment / Questions:

1. Differences between ETABS and other software of industry like STAAD AutoCAD (CO3, COB3)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 13 **Duration of Lesson:** 3 hrs

Lesson Title: Modelling of Building using Software

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Model a Beam in ETABS
2. Design of beam using ETABS
3. Check for the reinforcements and compare with already designed beam

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Beam Design: using ETABS

Fetch the reinforcement details

Identify the SFD and BMD

Assignment / Questions:

1. Analyzing the capacity of a modeled beam – SFD & BMD (CO3, COB3)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 14 **Duration of Lesson:** 3 hrs

Lesson Title: Modelling of Building using Software

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Modeling of a portal frame using ETABS

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Portal Frame modelling using ETABS Identify the SFD and BMD

Assignment / Questions:

1. Creating similar frames to analyse the SFD and BMD values (CO3, COB3)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 15 **Duration of Lesson:** 3 hrs

Lesson Title: Design of G+3 storey building using Software

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Model a 3D building

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Modelling in 3D

Defining creating and assigning the sections

Assignment / Questions:

1. Model a structure for different plans (CO3, COB3)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year	:	2021-2022	**Semester**	:	I
Name of the Program:		M.Tech	**Year**	:	I Year
Course/Subject	:	Structural Design Lab	**Course Code**	:	GR20D5009
Name of the Faculty	:	Mr. C Vanadeep / Mr. C Vivek Kumar			
Designation: Assistant Professor			**Department:** Civil Engineering		
Lesson No: 16, 17			**Duration of Lesson:** 3 hrs		

Lesson Title: Design of G+3 storey building using Software

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Applying loads on the 3D modeled building
2. Analyze the building

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

3D modeling
Applying the loads involved
Analysis on the building

Assignment / Questions:

1. Application of loads based on IS 875 (CO3, COB3)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 18 **Duration of Lesson:** 3 hrs

Lesson Title: Practice on Structural design software

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Model a 3D building
2. Applying loads on the 3D modeled building
3. Analyze the building

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

3D modeling
Applying the loads involved
Analysis on the building

Assignment / Questions:

1. Model for varying plans (CO3, COB3)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 19 **Duration of Lesson:** 3 hrs

Lesson Title: Practice on Structural design software

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Model a 3D building
2. Applying loads on the 3D modeled building
3. Analyze the building

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

3D modeling
Applying the loads involved
Analysis on the building

Assignment / Questions:

1. Model for varying plans and heights (CO3, COB3)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year	:	2021-2022	**Semester**	:	I
Name of the Program:		M.Tech	**Year**	:	I Year
Course/Subject	:	Structural Design Lab	**Course Code**	:	GR20D5009
Name of the Faculty	:	Mr. C Vanadeep / Mr. C Vivek Kumar			
Designation: Assistant Professor			**Department:** Civil Engineering		
Lesson No: 20			**Duration of Lesson:** 3 hrs		

Lesson Title: Design of all the Structural Components of Retaining Wall

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Design of Stem of Retaining Wall
2. Design of Toe and Heel of Retaining Wall

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Design of following components of Retaining Wall

1. Stem
2. Toe
3. Heel

Assignment / Questions:

1. Short notes on shear key in retaining walls (CO4, COB4)
2. Make a note of different types of retaining walls (CO4, COB4)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 21 **Duration of Lesson:** 3 hrs

Lesson Title: Design of all the Structural Components of Retaining Wall (MS Excel)

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Design of Stem of Retaining Wall in MS Excel
2. Design of Heel of Retaining Wall in MS Excel

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Using Excel to write design steps to design Stem of RW

Using Excel to write design steps to design Heel of RW

Assignment / Questions:

1. Using Excel to write design steps to design Toe of RW (CO4, COB4)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor **Department:** Civil Engineering

Lesson No: 22 & 23 **Duration of Lesson:** 3 hrs

Lesson Title: Analysis of Bridge Deck slab

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Modelling of Deck Slab using ETABS
2. Analysis of the model

TEACHING AIDS **:** Lab Manual, Laptop, Projector, Demonstration.

TEACHING POINTS **:**

Modelling steps involved for Deck Slab bridge using ETABS
Analysis aspects involved for Deck Slab bridge in ETABS

Assignment / Questions:

1. Make a note of different Types of Bridges (CO5, COB5)
2. Differences between types of Bridges (CO5, COB5)

Signature of faculty

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

COURSE COMPLETION STATUS

Academic Year : 2021-2022 **Semester** : I

Name of the Program: M.Tech **Year** : I Year

Course/Subject : Structural Design Lab **Course Code** : GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation: Assistant Professor

Actual Date of Completion & Remarks, if any

Cycle	Remarks	Objectives Achieved	Outcomes Achieved
Cycle I	Covered in Time	1,2,3	1,2,3
Cycle II	Covered in Time	1,3,4,5	1,3,4,5

Signature of HOD

Date:

Signature of faculty

Date:

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

Academic Year : 2021-2022 **Semester : I**

Name of the Program: M.Tech **Year : I Year**

Course/Subject :Structural Design Lab **Course Code :** GR20D5009

Name of the Faculty :Mr. C Vanadeep / Mr. C Vivek Kumar

Designation : Assistant Professor **Department:** Civil Engineering

1. TARGET:

a) Percentage for pass: 100%

b) Percentage of class:

First class with distinction	20
First class	20
Pass class	00
Total strength	21

2. COURSE PLAN & CONTENT DELIVERY

- 100 practice classes held for detailed demonstration of experiments and for analyzing real time experiments in the lab.

3. **METHOD OF EVALUATION**

3.1 ☐ Continuous Assessment Examinations (CAE-I, CAE-II)

3.2 ☐ Assignments/Seminars

3.3 ☐ Mini Projects

3.4 ☐ Quiz

3.5 ☐ Semester/End Examination

3.6 ☐ Others

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

GokarajuRangaraju Institute of Engineering and Technology (Autonomous)

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

Assessment in relation to CO's and COB's

Assessment:

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

Course Outcomes / Assessments	1	2	3	4	5
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X
4					
5					

Course Objectives / Assessments	1	2	3	4	5
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X
4					
5					

GokarajuRangaraju Institute of Engineering and Technology (Autonomous)
Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

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

Course Objectives - Course Outcomes Relationship Matrix

Course Outcomes / Course Objectives	1	2	3	4	5
1	X	X	X		
2	X	X			
3	X		X		
4		X			
5				X	X

Course Outcomes - Program Outcomes relations (Contributions: High, Medium and Low)

Structural Design Lab (GR20D5009) CO's	1	2	3	4	5	6
1. Understand the software usages and produce structural drawing for structural members.	H	H	H		M	M
2. Design and analyze plane frame and truss subjected to different type of loading.	H	H	H			M
3. Design, detailing and estimations of RC structural members like beam, column, slab, and Footing	M	M	M			M
4. Design and analysis of bridge deck slab for different loading conditions	M	H	H		M	M
5. Design and analysis of retaining wall for different loading conditions.	H	H	H	M	M	M

Course Objectives - Program Outcomes (PO's) Relationship Matrix

Program Outcomes / Course Objectives	1	2	3	4	5	6
1	H	H	H		M	M
2	H	H	H			M
3	M	M	M			M
4	M	M	M			M
5	H	H	H	M	M	M

Course Outcomes - Program Outcomes relations (PO's) Relationship Matrix

Program Outcomes / Course Outcomes	1	2	3	4	5	6
1	x	x	x		x	x
2	x	x	x			x
3	x	x	x			x
4	x	x	x			x
5	x	x	x	x	x	x

Courses (with title & code)-Program Outcomes (PO's) Relationship Matrix

Course: Structural Design Lab

Program Outcomes / Courses	1	2	3	4	5	6
1	x		x	x	x	x

Program Educational Objectives (PEOs) - Course Outcomes Relationship Matrix

Program Educational Objectives / Course Outcomes	1	2	3	4
1	x			x
2	x		x	x
3	x	x	x	
4	x	x		
5	x		x	x

GokarajuRangaraju Institute of Engineering and Technology (Autonomous)

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

Rubric Template – Structural Design Lab

Academic Year : 2021-2022 **Semester : I**

Name of the Program: M.Tech **Year : I Year**

Course/Subject : Structural Design Lab **Course Code :** GR20D5009

Name of the Faculty : Mr. C Vanadeep / Mr. C Vivek Kumar

Designation : Assistant Professor **Department:** Civil Engineering

		Beginning	Developing	Reflecting Development	Accomplished	Exemplary	Score
Name of the Student	**Performance Criteria**	**1**	**2**	**3**	**4**	**5**	
	Level of knowledge on fundamental laboratory tests and collect, analyze or synthesize appropriate data.	Inability to perform fundamental laboratory tests or collect, analyze, or synthesize appropriate data	Able to collect, analyze, and synthesize data related to the properties and behavior of soils in the geotechnical laboratory	Ability to observe collection of samples, perform fundamental laboratory tests, and collect, analyze, and synthesize appropriate data.	Knowledge on collection of Samples & independently perform fundamental laboratory tests, and collect, analyze, and synthesize appropriate data with few procedural errors	Full knowledge on collection of soil samples, independently perform fundamental laboratory tests, and collect, analyze, and synthesize appropriate data with no procedural errors	5
	Level of knowledge on properties of SCC mixes and assessment using appropriate laboratory analysis.	Low level of knowledge on scc properties and the respective laboratory analyses.	Able to understand the importance of SCCmixes and effecting factors.	Ability to apply the knowledge of scc properties in choosing appropriate laboratory analysis	Full Knowledge on properties of scc and assessment of vital parameters using laboratory analyses.	Analyzing all practical aspects of scc properties and their key role in the field of construction.	5
	Level of knowledge on tensile, compressive and flexure strength properties and their real time applications.	Low level of knowledge on strength parameters and their real time applications.	Able to understand the strength parameters under various loading conditions.	Ability to apply the knowledge in the determination of strength parameters	Full knowledge on strength parametersand the respective laboratory analyses.	Analyzing the importance of strength parameters under various existing conditions and their respective applications.	5

Department of Civil Engineering
Structural Design Lab

1. Design a reinforced concrete slab for a hall measuring 3 m x 8 m. The slab is supported over the RCC beams 250 mm wide and spaced at 4 m c/c. The superimposed load is 4 kN/m^2. Use M20 concrete and Fe415 steel. Assume necessary data required.

2. Design a reinforced concrete slab for a hall measuring 2.5 m x 7.5 m. The slab is supported over the RCC beams 250 mm wide and spaced at 3.5 m c/c. The superimposed load is 4.5 kN/m^2. Use M25 concrete and Fe415 steel. Assume necessary data required.

3. Design a slab over a room 4 m x 6 m as per IS code. The edge of the slab is simply supported, and the corner are not held down. The live load on the slab is 3 kN/m^2. The slab has a bearing of 150 mm on supporting walls. Use M20 concrete and Fe415 steel.

4. Design a slab over a room 4 m x 5 m as per IS code. The edge of the slab is simply supported, and the corner are not held down. The live load on the slab is 4 kN/m^2. The slab has a bearing of 150 mm on supporting walls. Use M25 concrete and Fe415 steel.

5. Design a short column of size 400 mm x 500 mm subjected an axial load Pu = 250 kN and biaxial bending moment as follows: Mux = 150 kN-m, Muy = 120 kN-m, Use M25 concrete and Fe 415 steel.

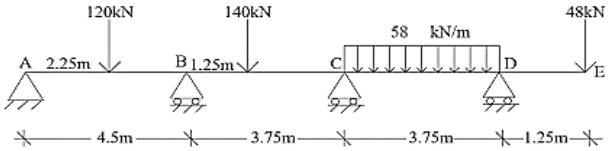
6. Design a short column of size 500 mm x 600 mm subjected an axial load Pu = 200 kN and biaxial bending moment as follows: Mux = 150 kN-m, Muy = 120 kN-m, Use M20 concrete and Fe 415 steel.

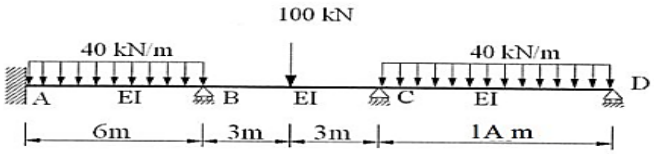
7. Design a combined rectangular footing for RC columns A and B separated by 4m c/c. Column A is 500x500 sq.mm and column B 600x600 sq.mm CSA and carries 1200 kN and 1600 kN respectively. SBC of soil is 200 kN/m^2. Use M25 and Fe415 grades.

8. Design a continuous beam of three equal spans of 3m to carry a DL of 15 kN/m^2 and LL of 10 kN/m^2. Use M20 concrete and Fe415 steel. [Mid Span]

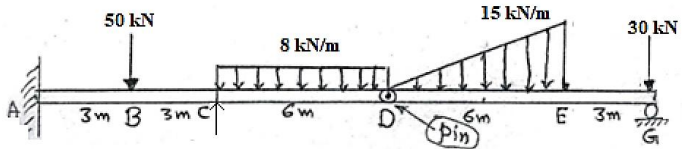
9. Design a continuous beam of three equal spans of 3m to carry a DL of 15 kN/m^2 and LL of 10 kN/m^2. Use M20 concrete and Fe415 steel. [End Span]

10. Analyse and design the RCC beam for the following support and load conditions. Show SFD and BMD.

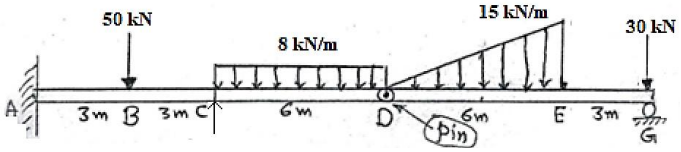




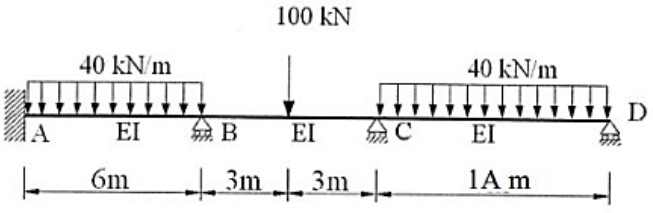
11. Analyse and design the RCC beam for the following support and load conditions. Show SFD and BMD.



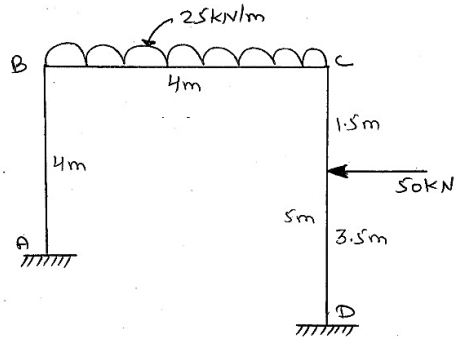
12. Analyse and design the RCC beam for the following support and load conditions. Show SFD and BMD.



13. Analyse and design the RCC beam for the following support and load conditions. Show SFD and BMD.



14. Analyse and design the RCC Frame for the following support and load conditions. Show SFD and BMD.



15. Analyse and Design the 3D frame (G+7) with a size of 25 m x 20 m consists of 5 m x 4 m Bay size with DL, LL with their load combinations. Assume whichever data necessary.

16. Analyse and Design the 3D steel truss with a size of 12 m x 20 m consists of 5 m Bay size with DL, LL with their load combinations. Assume whichever data necessary.

GokarajuRangaraju Institute of Engineering and Technology (Autonomous)

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

M. Tech STRUCTURAL ENGINEERING

STRUCTURAL DESIGN LAB EXTERNAL EXAM MARK SHEET

S.No.	Roll. No.	Name	Write Up (25M)	Execution (25M)	Viva (25M)	Total (70M)
1	21241D2001	ATKAPURAM PRASHANTH	21	23	17	61
2	21241D2002	BANDI SRI RAM GOPAL	23	23	18	64
3	21241D2003	CHALLA MADHAVI	20	22	18	60
4	21241D2004	PAMMI DIVYA	21	20	18	59
5	21241D2005	DUMMA UMESH KUMAR	24	25	16	65
6	21241D2006	K LATHASREE	23	24	18	65
7	21241D2007	MARIYALA VAISHNAVI	25	25	17	67
8	21241D2008	MAVOORI PRANAV	21	22	15	58
9	21241D2009	MITTAPALLI NAGA ASHWINI	25	25	16	66
10	21241D2010	RAVULA VENKATA SURAJ REDDY	17	17	14	48
11	21241D2011	REPATI MOHAN BABU	18	18	12	48
12	21241D2012	SANDHYA CHERUKU	23	22	19	64
13	21241D2013	SHAIK FEROZ	23	25	16	64
14	21241D2014	SK SAI CHANDRA	22	21	15	58
15	21241D2015	THOTA HARSHAVARDHAN	22	22	14	58
16	21241D2016	VARIKUPPALA LALITHA	23	24	16	63
17	21241D2017	YAMBA RAMA GNANENDRA SAI	19	16	14	49
18	21241D2018	YENUMALA DEVESH GOUD	18	17	14	49
19	21241D2019	S PRASHANTH KUMAR	ab	ab	ab	0
20	21241D2020	BAVANDLAPELLI THARUN TEJA	17	16	12	45
21	21241D2021	G NITISH KUMAR	18	18	10	46