(GR18A3010) Geotechnical Engineering Lab

III-B.Tech – I Semester

(2021-22)

G.Swetha/ T.Jahnavi /G.Manisha

Assistant Professor

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

Geotechnical Engineering Lab

Course File Check List

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GR 14 Regulations

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

III Year B.Tech. CE – I Semester	**L**	**T/P/D**	**C**
	0	**-/3/-**	**2**

(GR18A3010) GEOTECHNICAL ENGINEERING LAB

1. Liquid Limit
2. Plastic Limit
3. Field density by Core Cutter method
4. Field density by Sand Replacement method
5. Grain size distribution by sieve analysis
6. Grain size distribution by hydrometer analysis
7. Standard and Modified Compaction test
8. Permeability test of soil by constant and variable head methods
9. CBR test
10. Consolidation test
11. Unconfined Compression test
12. Direct shear test
13. Vane shear test
14. Tri-axial Compression test (Demo)
15. Relative Density

Gokaraju Rangaraju Institute of Engineering and Technology
(Autonomous)

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

Program Educational Objectives of CE

This education is meant to prepare our students to thrive and lead. During their progression, our graduates will

PEO 1: Graduates of the programme will be successful in technical and professional career.

PEO 2: Graduates of the programme will have proficiency in solving real time Civil Engineering projects.

PEO 3: Graduates of the programme will continue to engage in life-long learning with ethical and social responsibility.

Program Outcomes

Graduates of the Civil Engineering programme will be able to

a. Apply knowledge of mathematics, science and fundamentals of Civil Engineering.

b. Analyse problem and interpret the data.

c. Design a system component, or process to meet desired needs in Civil Engineering within realistic constraints.

d. Identify, formulate, analyse and interpret data to solve Civil Engineering problems.

e. Use modern engineering tools such as CAD and GIS for the Civil Engineering practice.

f. Understand the impact of engineering solutions in a global, economic and societal context.

g. Understand the effect of Civil Engineering solutions on environment and to demonstrate the need for sustainable development.

h. Understanding of professional and ethical responsibility.

i. Work effectively as an individual or in a team and to function on multi-disciplinary context.

j. Communicate effectively with engineering community and society.

k. Demonstrate the management principles in Civil Engineering projects.

l. Recognize the need for and an ability to engage in life-long learning.

Program Specific Outcomes (PSOs)

PSO1: Recognize the need for a sustainable environment and design smart infrastructure considering the global challenges.

PSO 2: Create and develop innovative designs with new era materials through research and development.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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

COURSE OBJECTIVES

Academic Year : 2021-22 **Semester : I**

Name of the Program: B.Tech **Year:** III Year **Section:** A / B

Course/Subject : Geotechnical Engineering Lab **Course Code** : GR18A3010

Name of the Faculty : G.Swetha/ T.Jahnavi /G.Manisha

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

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

S. No	Course Objectives
1	Distinguish various soil properties and its behavior.
2	Carry out firm foundation in testing various types of soils and their properties.
3	Experience with the measurement of geotechnical laboratory parameters.
4	Excel in experiment research and to succeed with real time projects.
5.	Ability to design and conduct experiments as well as analyze and interpret data.

Signature of HOD Signature of faculty

Date: Date:

Note: Please refer to Bloom's Taxonomy, to know the illustrative verbs that can be used to state the objectives.

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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

COURSE OUTCOMES

Academic Year : 2021-22 **Semester : I**

Name of the Program: B.Tech **Year:** III Year **Section:** A / B

Course/Subject : Geotechnical Engineering Lab **Course Code**: **GR18A3010**

Name of the Faculty : G.Swetha/ T.Jahnavi /G.Manisha

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

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

S. No	Course Outcomes
1	Analyze soil behavior and its mechanism.
2	Find role of basic properties of soil in simple and complex applications.
3	Develop a proficiency in handling experimental data.
4	Report the results of a laboratory experiment at a professional standard.
5	Recommend extensive research in geotechnical properties.

Signature of HOD Signature of faculty

Date: Date:

Note: Please refer to Bloom's Taxonomy, to know the illustrative verbs that can be used to state the objectives.

Gokaraju Rangaraju Institute of Engineering and Technology

(Autonomous)

Department of Civil Engineering

Geotechnical Engineering Lab

Cycle-1: Experiments based on Index properties of soil

- Atterberg's Limits:
  1. Determination of Liquid Limit
  2. Determination of Plastic Limit
- Field Density Tests
  1. Determination of field density by Core Cutter method
  2. Determination of field density by Sand replacement method
- Grain size distribution by sieve and hydrometer analysis Compaction Test
  1. Standard Compaction method
  2. Modified Compaction Method
- Relative Density Test

Cycle-II: Experiments based on Engineering Properties of soil

- Permeability Test
  1. By Constant Head Method
  2. By Variable Head Method
- California Bearing Ratio Test (CBR) by using Light/Heavy Rammers
- Consolidation Test
- Unconfined Compression Test
- Shear Strength Test
  1. Vane Shear test
  2. Direct Shear test
  3. Tri-axial Compression test (Demo)

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

COURSE SCHEDULE

Academic Year : 2021-22 **Semester** : I

Name of the Program: B.Tech. **Year:III Section:** A

Course/Subject: Geotechnical Engineering lab **Course Code: GR18A3010**

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

The Schedule for the whole Course / Subject is:

S. No.	Description	Duration (Date)		Total No. of Periods
		From	To	
1.	Introduction and Demonstration	16-8-21	16-8-21	03
2.	**Exercise-I** Liquid limit, Plastic limit, Sieve analysis, hydrometer analysis	16-8-21	6-9-21	12
3.	**Exercise-II** Core cutter, Sand replacement, Compaction, Relative Density.	30-8-21	27-9-21	15
4.	Revision of Exercise-I/II Experiments	23-8-21	28-9-21	06
4.	**Exercise-III:** Direct shear, Vane shear, CBR, Unconfined compressive test.	8-11-21	29-11-21	15
5.	**Exercise-IV:** Permeability, Consolidation, Tri-axial Test (Demo).	11-10-21	1-11-21	09
6.	Revision of Exercise-III/IV Experiments.	23-11-21	6-12-21	03

1. Total No. of Instructional periods available for the course: **60** Hours / Periods

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

Academic Year : 2021-22 **Semester** : **I**

Name of the Program: B.Tech. **Year:**III **Section:** A

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

The Course plan for the whole Course / Subject is:

Exercise.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (GTE Lab Manual) Page Nos.: ___to ___
1.	1.	16-8-21	3	Liquid limit & Plastic limit	COB's - 1,3 CO's - 1,2	30 to 38
	2.	17-08-21	3	Sieve analysis	COB's - 1,3 CO's - 1,2	21 to 24
	3.	30-8-21	3	Core Cutter	COB's - 1,3 CO's - 1,2	16 to 20
2.	4.	31-8-21	3	Sand Replacement	COB's - 1,3 CO's - 1,2	10 to 15
	5.	6-9-21	3	Compaction	COB's - 1,3 CO's - 1,2	59 to 62
	6.	20-9-21	3	Relative Density	COB's - 1,3 CO's - 1,2	
3.	7.	27-9-21	3	Direct Shear Test	COB's - 1,3 CO's - 1,2	67 to 73
	8.	4-10-21	3	Vane Shear Test	COB's - 1,3 CO's - 1,2	63 to 64
	9.	11-10-21	3	Unconfined Compressive Test	COB's - 1,3 CO's - 1,2	74 to 79
	10.	25-10-21	3	CBR	COB's - 1,3 CO's - 1,2	94 to 101
4.	11.	1-11-21	3	Permeability	COB's - 1,3 CO's - 1,2	45 to 58
	12.	6-12-21	3	Consolidation	COB's - 1,3 CO's - 1,2	87 to 93
	13.	15-11-21	3	Triaxial Test (Demo)	COB's - 1,3,5 CO's - 1,2,3	80 to 86

Signature of HOD
Date:

Signature of faculty
Date:

Note: 1. ENSURE THAT ALL TOPICS SPECIFIED IN THE COURSE ARE MENTIONED.
2. ADDITIONAL TOPICSCOVERED, IF ANY, MAY ALSO BE SPECIFIED IN BOLD

3. MENTION THE CORRESPONDING COURSE OBJECTIVE AND OUT COME NUMBERS AGAINST EACH TOPIC.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

COURSE SCHEDULE

Academic Year : 2021-22 **Semester** : **I**

Name of the Program: B.Tech. **Year: III** **Section:** B

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

The Schedule for the whole Course / Subject is:

S. No.	Description	Duration (Date)		Total No. of Periods
		From	To	
1.	Introduction and Demonstration	18-8-21	18-8-21	03
2.	**Exercise-I** Liquid limit, Plastic limit, Sieve analysis, hydrometer analysis	18-8-21	17-9-21	12
3.	**Exercise-II** Core cutter, Sand replacement, Compaction, Relative Density	1-9-21	06-10-21	09
4.	**Exercise-III:** Direct shear, Vane shear, CBR, Unconfined compressive test	17-11-21	1-12-21	09
5.	**Exercise-IV:** Permeability, Consolidation, Tri-axial Test (Demo)	27-10-21	10-11-21	09
6.	Revision	19-11-21	3-12-21	03

1. Total No. of Instructional periods available for the course: **60** Hours / Periods

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

Academic Year : 2021-22 **Semester** : **I**

Name of the Program: B.Tech. **Year:**III **Section:** A1

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

The Course plan for the whole Course / Subject is:

Exercise.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (GTE Lab Manual) Page Nos.: ___to ___
1.	1.	18-8-21	3	Liquid Limit & Plastic limit	COB's - 1,3 CO's - 1,2	30 to 38
	2.	25-08-21	3	Sieve analysis	COB's - 1,3 CO's - 1,2	21 to 24
	3.	1-9-21	3	Core Cutter	COB's - 1,3 CO's - 1,2	16 to 20
2.	4.	8-9-21	3	Sand Replacement	COB's - 1,3 CO's - 1,2	10 to 15
	5.	17-9-21	3	Compaction	COB's - 1,3 CO's - 1,2	59 to 62
	6.	24-9-21	3	Relative Density	COB's - 1,3 CO's - 1,2	
3.	7.	27-10-21	3	Direct Shear Test	COB's - 1,3 CO's - 1,2	67 to 73
	8.	3-11-21	3	Vane Shear Test	COB's - 1,3 CO's - 1,2	63 to 64
	9.	10-11-21	3	Unconfined Compressive Test	COB's - 1,3 CO's - 1,2	74 to 79
	10.	17-11-21	3	CBR	COB's - 1,3 CO's - 1,2	94 to 101
4.	11.	24-11-21	3	Permeability	COB's - 1,3 CO's - 1,2	45 to 58
	12.	1-12-21	3	Consolidation	COB's - 1,3 CO's - 1,2	87 to 93
	13.	8-12-21	3	Triaxial Test (Demo)	COB's - 1,3,5 CO's - 1,2,3	80 to 86

Signature of HOD
Date:

Signature of faculty
Date:

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

Academic Year : 2021-22 **Semester** : **I**

Name of the Program: B.Tech. **Year:**III **Section: A2**

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (GT lab Manual) Page Nos.: __to___
1.	16-8-21	3	Water content	COB's - 1,3 CO's - 1,2	K1	01 to 04
2.	17-08-21	3	Liquid limit test	COB's - 1,3 CO's - 1,2	K4	30 to 34
3.	30-8-21	3	Plastic limit test	COB's - 1,3 CO's - 1,2	K4	35 to 38
4.	23-8-21	3	Sieve analysis	COB's - 1,3 CO's - 1,2	K4	21 to 24
5.	24-8-21	3	Core cutter	COB's - 1,3 CO's - 1,2	K4	16 to 20
6.	8-9-21	3	Sand replacement method	COB's - 1,3 CO's - 1,2	K4	10 to 15
7.	7-9-21	3	Standard Compaction	COB's - 1,3 CO's - 1,2	K4	59 to 62
8.	14-9-21	3	Modified Compaction	COB's - 1,3 CO's - 1,2	K4	59 to 62
9.	31-8-21	3	Details of density test	COB's - 1,3,5 CO's - 1,2,3	K4	Text Book - 1 23 to 25
10.	6-9-21	3	Details of compaction test	COB's – 1,3,5 CO's - 1,2,3	K4	Text Book – 1 107 to 113
11.	20-9-21	3	Relative Density	COB's – 1,3,5 CO's - 1,2,3	K4	

Signature of HOD
Date:

Signature of faculty
Date:

Note: 1. ENSURE THAT ALL TOPICS SPECIFIED IN THE COURSE ARE MENTIONED.
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3. MENTION THE CORRESPONDING COURSE OBJECTIVE AND OUT COME NUMBERS AGAINST EACH TOPIC.

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

Academic Year : 2021-22 **Semester** : **I**

Name of the Program: B.Tech. **Year:**II **Section:** B1

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Lesson No.	Date	No. of Periods	Topics / Sub – Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (GT lab Manual) Page Nos.: _to _
1.	11-10-21	3	Direct Shear test	COB's - 1,3 CO's - 1,2	K4	52 to 58
2.	25-10-21	3	Vane Shear test	COB's - 1,3 CO's - 1,2	K4	45 to 51
3.	1-11-21	3	Unconfined Compressive Strength	COB's - 1,3 CO's - 1,2	K4	94 to 101
4.	8-11-21	3	CBR by Light rammer	COB's - 1,3 CO's - 1,2	K4	94 to 101
5.	15-11-21	3	CBR by Heavy rammer	COB's - 1,3 CO's - 1,2	K4	87 to 93
6.	16-11-21	3	Permeability- Variable head	COB's - 1,3 CO's - 1,2	K4	67 to 73
7.	23-11-21	3	Permeability- Constant head	COB's - 1,3 CO's - 1,2	K4	63 to 64
8.	22-11-21	3	Consolidation test	COB's - 1,3 CO's - 1,2	K4	74 to 79
9.	29-11-21	3	Tri-axial compression test (Demo)	COB's - 1,3,5 CO's - 1,2,3	K4	80 to 86
10.	6-12-21	3	Details of Consolidation test	COB's - 1,3,5 CO's - 1,2,3	K4	Text Book - 1 227 to 242

Signature of HOD
Date:

Signature of faculty
Date:

Note: 1. ENSURE THAT ALL TOPICS SPECIFIED IN THE COURSE ARE MENTIONED.
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3. MENTION THE CORRESPONDING COURSE OBJECTIVE AND OUT COME NUMBERS AGAINST EACH TOPIC.

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

Academic Year : 2021-22 **Semester** : **I**

Name of the Program: B.Tech. **Year:**II **Section:** B2

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

Lesson No.	Date	No. of Periods	Topics / Sub – Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (GT lab Manual) Page Nos.: __to __
1.	27-10-21	3	Direct Shear test	COB's - 1,3 CO's - 1,2	K4	52 to 58
2.	3-11-21	3	Vane Shear test	COB's - 1,3 CO's - 1,2	K4	45 to 51
3.	10-11-21	3	Unconfined Compressive Strength	COB's - 1,3 CO's - 1,2	K4	94 to 101
4.	17-11-21	3	CBR by Light rammer	COB's - 1,3 CO's - 1,2	K4	94 to 101
5.	24-11-21	3	CBR by Heavy rammer	COB's - 1,3 CO's - 1,2	K4	87 to 93
6.	5-11-21	3	Permeability- Variable head	COB's - 1,3 CO's - 1,2	K4	67 to 73
7.	12-11-21	3	Permeability- Constant head	COB's - 1,3 CO's - 1,2	K4	63 to 64
8.	19-11-21	3	Consolidation test	COB's - 1,3 CO's - 1,2	K4	74 to 79
9.	1-12-21	3	Tri-axial compression test (Demo)	COB's - 1,3,5 CO's - 1,2,3	K4	80 to 86
10.	8-12-21	3	Details of Consolidation test	COB's - 1,3,5 CO's - 1,2,3	K4	Text Book - 1 227 to 242

Signature of HOD
Date:

Signature of faculty
Date:

Note: 1. ENSURE THAT ALL TOPICS SPECIFIED IN THE COURSE ARE MENTIONED.
2. ADDITIONAL TOPICSCOVERED, IF ANY, MAY ALSO BE SPECIFIED IN BOLD
3. MENTION THE CORRESPONDING COURSE OBJECTIVE AND OUT COME NUMBERS AGAINST EACH TOPIC.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 16-8-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Lesson No: 1 **Duration of Lesson:** 3 hr

Lesson Title: Water Content

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Find the water content of various soils.
2. Recognize the range of water contents for various types of soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- This test is performed to determine the water (moisture) content of soils.
- The water content is the ratio, expressed as a percentage, of the mass of “pore” or “free” water in a given mass of soil to the mass of the dry soil solids.
- The water content is also used in expressing the phase relationships of air, water, and solids in a given volume of soil.

Assignment / Questions: Define Water Content
Note: Mention for each question the relevant Objectives and Outcom
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Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 16-8-21
Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: Liquid Limit test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Experiment Liquid limit for cohesive soils.
2. Outline the stress history of soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- The liquid limit is the moisture content at which the groove, formed by a standard tool into the sample of soil taken in the standard cup, closes for 10 mm on being given 25 blows in a standard manner.
- At this limit the soil possess low shear strength.
- From the results of liquid limit the compression index may be estimated.

Assignment / Questions:

1. Define Liquid Limit and its importance.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 17-08-21
Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Lesson No: 3 **Duration of Lesson:** 3 hr

Lesson Title: Plastic Limit test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Experiment plastic limit and identify the plasticity characteristics of soils.
2. Identify the moisture content at which soil changes from plastic state to semi-solid state.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- In the plastic state, the soil can be moulded to different shapes without rupturing it, due to its plasticity.
- If the water content is further reduced, the clay sample changes from the plastic state to the semi-solid state at a boundary water content which is called the plastic limit.
- In the semi-solid state the soil does not have plasticity; it becomes brittle. When pressure is applied, the soil simply crumbles.

Assignment / Questions:

1. Define Plastic limit and its importance.
2. Define Liquidity Index and Plasticity Index.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 6/09/21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: Sieve Analysis

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Infer the concept of grain size distribution and gradation of soils
2. Identify the relative proportions of different grain sizes which make up a given soil mass.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- The grain size analysis is widely used in classification of soils.
- The data obtained from grain size distribution curves is used in the design of filters for earth dams and to determine suitability of soil for road construction, air field etc.
- Information obtained from grain size analysis can be used to predict soil water movement although permeability tests are more generally used.

Assignment / Questions:

1. Give the grain size ranges of different soil types according to IS: 1498 (1970).

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 30-8-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: Core cutter Method

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Calculate the field dry density of soils by core cutter method.
2. Identify the in situ density of natural or compacted soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- The in situ density of natural soil is needed for the determination of bearing capacity of soils, for the purpose of stability analysis of slopes, for the determination of pressures on underlying strata for the calculation of settlement and the design of underground structures.
- It is very quality control test, where compaction is required, in the cases like embankment and pavement construction.

Assignment / Questions:

1. A 1000cc core cutter weighing 946.80 gm was used to find out the in-situ dry density of an embankment. The weight of core cutter filled with the soil was noted to be 2770.60 gm. Lab test on the sample indicated a water content of 10.45%.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 31-8-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: Sand Replacement Method

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Calculate the field dry density of soils by sand replacement method.
2. Identify the in situ density of natural or compacted soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- The in situ density of natural soil is needed for the determination of bearing capacity of soils, for the purpose of stability analysis of slopes, for the determination of pressures on underlying strata for the calculation of settlement and the design of underground structures.

Assignment / Questions:

1. During soil investigation for a residual complex site at hyderabad, the following observations were taken for the in-situ unit weight measurement by sand replacement method. Weight of excavated soil = 761.25 gm, weight of sand+cylinder =10500 gm, Weight of sand+cylinder after pouring in the excavated hole & cone = 9450 gm, weight of sand+cylinder after pouring for the cone only = 9005 gm, weight of sand in calibrating can after pouring from cylinder = 1550 gm. Calculate the in-situ unit weight of the soil.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology
Department of Civil Engineering
LESSON PLAN

Academic Year : 2021-22 **Date:** 20-9-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: Standard Compaction test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the maximum dry density and optimum moisture content for various soils.
2. Outline the results of laboratory standard compaction test.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- This method covers the determination of the relationship between the moisture content and density of soils is compacted in 3 layers, each layer tamped by 25 blows in a mould of a given size with a 2.6 kg rammer dropped from a height of 310 mm.
- In the laboratory, impact compaction is most commonly used; a rammer is dropped several times on a soil sample in a mould.
- In the field, compactive effort is the number of passes or coverage's of a roller of a certain kind and weight on a given volume of soil.

Assignment / Questions:

1. The compaction of an embankment is carried out in 300 mm thick lifts (Layers). The rammer used for compaction has the foot of area 0.05 m^2. The energy developed per drop of the rammer is 40 kg-m. Assuming 50% more energy in each pass over the compacted area due to overlap. Calculate the number of passes required to develop compactive energy equivalent to IS light compaction for each layer.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 20-9-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Lesson No: 8 **Duration of Lesson:** 3 hr

Lesson Title: Modified Compaction

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the maximum dry density and optimum moisture content for various soils.
2. Outline the results of laboratory modified compaction test.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- This method covers the determination of the relationship between the moisture content and density of soils is compacted in 5 layers, each layer tamped by 25 blows in a mould of a given size with a 4.9 kg rammer dropped from a height of 450 mm.
- In the laboratory, impact compaction is most commonly used; a rammer is dropped several times on a soil sample in a mould.
- In the field, compactive effort is the number of passes or coverage's of a roller of a certain kind and weight on a given volume of soil.

Assignment / Questions:

1. Compare the compactive energy used in the IS heavy compaction test with that of the IS light compaction test.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 27-9-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Lesson No: 11 **Duration of Lesson:** 3 hr

Lesson Title: Relative Density

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the maximum dry density and optimum moisture content for various soils.
2. Outline the results of laboratory modified compaction test..

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- This method covers the determination of the relationship between the moisture content and density of soils is compacted in 5 layers, each layer tamped by 25 blows in a mould of a given size with a 4.9 kg rammer dropped from a height of 450 mm.
- In the laboratory, impact compaction is most commonly used; a rammer is dropped several times on a soil sample in a mould.
- In the field, compactive effort is the number of passes or coverage's of a roller of a certain kind and weight on a given volume of soil.

Assignment / Questions:

1. Define Relative Density of a soil

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 11-10-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: Permeability by Variable Head Method

INSTRUCTIONAL/LESSON OBJECTIVES:

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

3. Analyse coefficient of permeability for various soils.
4. Point out the concept of permeability to estimate ground water flow, seepage through dams, uplift pressure and piping for fine grained soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- Hence permeability is defined as the rate of flow of water under laminar conditions through a unit cross-sectional area perpendicular to the direction of flow through a porous medium under unit hydraulic gradient and under standard temperature conditions.
- The study of seepage of water through soil is very important, with wide field applications.
- The falling/variable head method of determining permeability is used for soil with low discharge.

Assignment / Questions:

1. Define Permeability of a soil
2. List the factors that influence permeability of soils and mention the manner in which they do so.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 12-10-21

Semester : I

Name of the Program: B.Tech. **Year:II** **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: Permeability by Constant Head Method

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Analyse coefficient of permeability for various soils.
2. Point out the concept of permeability to estimate ground water flow, seepage through dams, uplift pressure and piping for coarse grained soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- Hence permeability is defined as the rate of flow of water under laminar conditions through a unit cross-sectional area perpendicular to the direction of flow through a porous medium under unit hydraulic gradient and under standard temperature conditions.
- The study of seepage of water through soil is very important, with wide field applications.
- The constant head permeability test is used for coarse-grained soils with a reasonable discharge in a given time.

Assignment / Questions:

1. Define Permeability of a soil

2. List the factors that influence permeability of soils and mention the manner in which they do so.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 25-10-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: CBR test with light rammer

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the CBR value for various types of soils.
2. Outline the results of standard CBR test and analyse sub grade strength of roads and pavements.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- It is the ratio of force per unit area required to penetrate a soil mass with standard circular piston at the rate of 1.25 mm/min. to that required for the corresponding penetration of a standard material.
- The test may be performed on undisturbed specimens and on remolded specimens which may be compacted either statically or dynamically.
- The results obtained by these tests are used with the empirical curves to determine the thickness of pavement and its component layers.
- This is the most widely used method for the design of flexible pavement.

Assignment / Questions:

1. Define CBR and its importance

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 25-10-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: CBR Test with Heavy rammer

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the CBR value for various types of soils.
2. Outline the results of modified CBR test and analyse sub grade strength of roads and pavements.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- California bearing ratio is the ratio of force per unit area required to penetrate in to a soil mass with a circular plunger of 50mm diameter at the rate of 1.25mm/min.
- The test may be performed on undisturbed specimens and on remolded specimens who may be compacted either statically or dynamically.
- The results obtained by these tests are used with the empirical curves to determine the thickness of pavement and its component layers.
- This is the most widely used method for the design of flexible pavement.

Assignment / Questions:

1. List out the standard loads adopted for different penetrations for the standard material with a C.B.R. value of 100%.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 6-12-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Lesson No: 16 **Duration of Lesson:** 3 hr

Lesson Title: Consolidation Test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the coefficient of consolidation and consolidation parameters
2. Calculate the time taken for 90 percent consolidation and 50 percent consolidation
3. Identify the extent of settlement of structures founded on fine-grained soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- The test is conducted to determine the settlement due to primary consolidation. To determine i. Rate of consolidation under normal load,I. Degree of consolidation at any time,Ii. Pressure-void ratio relationship, iv. Coefficient of consolidation at various pressures and v. Compression index.
- It is also helpful in analyzing the stress history of soil. Since the settlement analysis of the foundation depends mainly on the values determined by the test, this test is very important for foundation design.

Assignment / Questions:

1. How consolidation is different from compaction

2. What do you understand by the terms: immediate settlement, primary and secondary settlement.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 8-11-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Lesson No: 17 **Duration of Lesson:** 3 hr

Lesson Title: Direct Shear Test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the shear strength of the soil.
2. Identify the shear strength parameters.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- In many engineering problems such as design of foundation, retaining walls, slab bridges, pipes, sheet piling, the value of the angle of internal friction and cohesion of the soil involved are required for the design.
- Direct shear test is used to predict these parameters quickly.
- The laboratory report covers the laboratory procedures for determining these values for cohesionless soils.

Assignment / Questions:

1. Define shear strength of a soil. Is it possible to tabulate the values of shear strength for different soils?

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 15-11-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: Vane Shear Test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Calculate shear strength of soils and identify the sensitivity of soils.
2. Outline the undrained and remolded strength of soil.

TEACHING AIDS : White Board, marker, Lab Manual, and Demonstration

TEACHING POINTS :

- Where we cannot use tri-axial or unconfined tests, we make use of vane shear test, to find out shear strength of cohesive soils.
- The un-drained and remolded strength of soil obtained from the test are useful for evaluating sensitivity of soil.
- This test is conducted to measure strength of low shear strength soils.

Assignment / Questions:

1. Derive the relation between torque and shear strength, when you have the overall diameter of vane and spring constant.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 22-11-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

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

Lesson Title: Unconfined Compressive Test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Calculate unconfined compressive strength of soils
2. Identify the shear strength of soils.

TEACHING AIDS : White Board, marker, Lab Manual, and Demonstration

TEACHING POINTS :

- When the determination of strength using bearing capacity tests is not possible, we choose this experimental procedure to get the undisturbed and remolded strength of soils.
- Useful to investigate experimentally the strength of a given soil sample.

Assignment / Questions:

1. Write down the factors which affect the strength and explain the reasons for dissimilarity in the remolded and undisturbed strengths of a soil specimen?

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 29-11-21

Semester : I

Name of the Program: B.Tech. **Year:II** **Section:** A

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Lesson No: 20 **Duration of Lesson:** 3 hr

Lesson Title: Tri-axial Test (Demo)

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Calculate shear strength and angle of internal friction.
2. Differentiate various drainage conditions and determine pore pressures.

TEACHING AIDS : White Board, marker, Lab Manual, and Demonstration

TEACHING POINTS :

- In this experiment soil specimen is consolidated under all round pressure in the tri-axial cell before failure is brought about by increasing major principal stress.
- This can be done with or without measurement of pore pressure.
- Useful to obtain the relation between shear strength, value of cohesion and angle of shearing resistance of a soil.

Assignment / Questions:

1. Derive the relation between shear strength, value of cohesion and angle of shearing resistance of a soil.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 18-8-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: Water Content

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Find the water content of various soils.
2. Recognize the range of water contents for various types of soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- This test is performed to determine the water (moisture) content of soils.
- The water content is the ratio, expressed as a percentage, of the mass of “pore” or “free” water in a given mass of soil to the mass of the dry soil solids.
- The water content is also used in expressing the phase relationships of air, water, and solids in a given volume of soil.

Assignment / Questions:

1. Define Water Content.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 18-8-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: Liquid Limit test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Experiment Liquid limit for cohesive soils.
2. Outline the stress history of soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- The liquid limit is the moisture content at which the groove, formed by a standard tool into the sample of soil taken in the standard cup, closes for 10 mm on being given 25 blows in a standard manner.
- At this limit the soil possess low shear strength.
- From the results of liquid limit the compression index may be estimated.

Assignment / Questions:

1. Define Liquid Limit and its importance.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 25-08-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

Lesson No: 3 **Duration of Lesson:** 3 hr

Lesson Title: Plastic Limit test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Experiment plastic limit and identify the plasticity characteristics of soils.
2. Identify the moisture content at which soil changes from plastic state to semi-solid state.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- In the plastic state, the soil can be moulded to different shapes without rupturing it, due to its plasticity.
- If the water content is further reduced, the clay sample changes from the plastic state to the semi-solid state at a boundary water content which is called the plastic limit.
- In the semi-solid state the soil does not have plasticity; it becomes brittle. When pressure is applied, the soil simply crumbles.

Assignment / Questions:

1. Define Plastic limit and its importance.
2. Define Liquidity Index and Plasticity Index.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 17-9-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: Sieve Analysis

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Infer the concept of grain size distribution and gradation of soils
2. Identify the relative proportions of different grain sizes which make up a given soil mass.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- The grain size analysis is widely used in classification of soils.
- The data obtained from grain size distribution curves is used in the design of filters for earth dams and to determine suitability of soil for road construction, air field etc.
- Information obtained from grain size analysis can be used to predict soil water movement although permeability tests are more generally used.

Assignment / Questions:

1. Give the grain size ranges of different soil types according to IS: 1498 (1970).

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 1-9-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: Core cutter Method

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Calculate the field dry density of soils by core cutter method.
2. Identify the in situ density of natural or compacted soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- The in situ density of natural soil is needed for the determination of bearing capacity of soils, for the purpose of stability analysis of slopes, for the determination of pressures on underlying strata for the calculation of settlement and the design of underground structures.
- It is very quality control test, where compaction is required, in the cases like embankment and pavement construction.

Assignment / Questions:

1. A 1000cc core cutter weighing 946.80 gm was used to find out the in-situ dry density of an embankment. The weight of core cutter filled with the soil was noted to be 2770.60 gm. Lab test on the sample indicated a water content of 10.45%.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 8-9-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: Sand Replacement Method

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Calculate the field dry density of soils by sand replacement method.
2. Identify the in situ density of natural or compacted soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- The in situ density of natural soil is needed for the determination of bearing capacity of soils, for the purpose of stability analysis of slopes, for the determination of pressures on underlying strata for the calculation of settlement and the design of underground structures.

Assignment / Questions:

1. During soil investigation for a residual complex site at hyderabad, the following observations were taken for the in-situ unit weight measurement by sand replacement method. Weight of excavated soil = 761.25 gm, weight of sand+cylinder =10500 gm, Weight of sand+cylinder after pouring in the excavated hole & cone = 9450 gm, weight of sand+cylinder after pouring for the cone only = 9005 gm, weight of sand in calibrating can after pouring from cylinder = 1550 gm. Calculate the in-situ unit weight of the soil.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 24-9-21

Semester : I

Name of the Program: B.Tech. **Year:III** **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: Standard Compaction test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the maximum dry density and optimum moisture content for various soils.
2. Outline the results of laboratory standard compaction test.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- This method covers the determination of the relationship between the moisture content and density of soils is compacted in 3 layers, each layer tamped by 25 blows in a mould of a given size with a 2.6 kg rammer dropped from a height of 310 mm.
- In the laboratory, impact compaction is most commonly used; a rammer is dropped several times on a soil sample in a mould.
- In the field, compactive effort is the number of passes or coverage's of a roller of a certain kind and weight on a given volume of soil.

Assignment / Questions:

1. The compaction of an embankment is carried out in 300 mm thick lifts (Layers). The rammer used for compaction has the foot of area 0.05 m^2. The energy developed per drop of the rammer is 40 kg-m. Assuming 50% more energy in each pass over the compacted area due to overlap. Calculate the number of passes required to develop compactive energy equivalent to IS light compaction for each layer.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 24-9-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

Lesson No: 8 **Duration of Lesson:** 3 hr

Lesson Title: Modified Compaction

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the maximum dry density and optimum moisture content for various soils.
2. Outline the results of laboratory modified compaction test.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- This method covers the determination of the relationship between the moisture content and density of soils is compacted in 5 layers, each layer tamped by 25 blows in a mould of a given size with a 4.9 kg rammer dropped from a height of 450 mm.
- In the laboratory, impact compaction is most commonly used; a rammer is dropped several times on a soil sample in a mould.
- In the field, compactive effort is the number of passes or coverage's of a roller of a certain kind and weight on a given volume of soil.

Assignment / Questions:

1. Compare the compactive energy used in the IS heavy compaction test with that of the IS light compaction test.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 06-10-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

Lesson No: 11 **Duration of Lesson:** 3 hr

Lesson Title: Relative Density

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the maximum dry density and optimum moisture content for various soils.
2. Outline the results of laboratory modified compaction test.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- This method covers the determination of the relationship between the moisture content and density of soils is compacted in 5 layers, each layer tamped by 25 blows in a mould of a given size with a 4.9 kg rammer dropped from a height of 450 mm.
- In the laboratory, impact compaction is most commonly used; a rammer is dropped several times on a soil sample in a mould.

Assignment / Questions:

1. Define Relative Density of a soil

2. List the factors that influence permeability of soils and mention the manner in which they do so.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date: 27-10-21**23/03/18

Semester : I

Name of the Program: B.Tech. **Year:III** **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: Permeability by Variable Head Method

INSTRUCTIONAL/LESSON OBJECTIVES:

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

3. Analyse coefficient of permeability for various soils.
4. Point out the concept of permeability to estimate ground water flow, seepage through dams, uplift pressure and piping for fine grained soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- Hence permeability is defined as the rate of flow of water under laminar conditions through a unit cross-sectional area perpendicular to the direction of flow through a porous medium under unit hydraulic gradient and under standard temperature conditions.
- The study of seepage of water through soil is very important, with wide field applications.
- The falling/variable head method of determining permeability is used for soil with low discharge.

Assignment / Questions:

1. Define Permeability of a soil
2. List the factors that influence permeability of soils and mention the manner in which they do so.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 27-10-21

Semester : I

Name of the Program: B.Tech. **Year:II** **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: Permeability by Constant Head Method

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Analyse coefficient of permeability for various soils.
2. Point out the concept of permeability to estimate ground water flow, seepage through dams, uplift pressure and piping for coarse grained soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- Hence permeability is defined as the rate of flow of water under laminar conditions through a unit cross-sectional area perpendicular to the direction of flow through a porous medium under unit hydraulic gradient and under standard temperature conditions.
- The study of seepage of water through soil is very important, with wide field applications.
- The constant head permeability test is used for coarse-grained soils with a reasonable discharge in a given time.

Assignment / Questions:

1. Define Permeability of a soil

2. List the factors that influence permeability of soils and mention the manner in which they do so.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 3-11-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: CBR test with light rammer

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the CBR value for various types of soils.
2. Outline the results of standard CBR test and analyse sub grade strength of roads and pavements.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- It is the ratio of force per unit area required to penetrate a soil mass with standard circular piston at the rate of 1.25 mm/min. to that required for the corresponding penetration of a standard material.
- The test may be performed on undisturbed specimens and on remoulded specimens which may be compacted either statically or dynamically.
- The results obtained by these tests are used with the empirical curves to determine the thickness of pavement and its component layers.
- This is the most widely used method for the design of flexible pavement.

Assignment / Questions:

1. Define CBR and its importance

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 3-11-21

Semester : I

Name of the Program: B.Tech. **Year:III** **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: CBR Test with Heavy rammer

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the CBR value for various types of soils.
2. Outline the results of modified CBR test and analyse sub grade strength of roads and pavements.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- California bearing ratio is the ratio of force per unit area required to penetrate in to a soil mass with a circular plunger of 50mm diameter at the rate of 1.25mm/min.
- The test may be performed on undisturbed specimens and on remoulded specimens which may be compacted either statically or dynamically.
- The results obtained by these tests are used with the empirical curves to determine the thickness of pavement and its component layers.
- This is the most widely used method for the design of flexible pavement.

Assignment / Questions:

1. List out the standard loads adopted for different penetrations for the standard material with a C.B.R. value of 100%.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 10-11-21

Semester : I

Name of the Program: B.Tech. **Year:I**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

Lesson No: 16 **Duration of Lesson:** 3 hr

Lesson Title: Consolidation Test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the coefficient of consolidation and consolidation parameters
2. Calculate the time taken for 90 percent consolidation and 50 percent consolidation
3. Identify the extent of settlement of structures founded on fine-grained soils.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- The test is conducted to determine the settlement due to primary consolidation. To determine i. Rate of consolidation under normal load,I. Degree of consolidation at any time,Ii. Pressure-void ratio relationship, iv. Coefficient of consolidation at various pressures and v. Compression index.
- It is also helpful in analyzing the stress history of soil. Since the settlement analysis of the foundation depends mainly on the values determined by the test, this test is very important for foundation design.

Assignment / Questions:

1. How consolidation is different from compaction

2. What do you understand by the terms: immediate settlement, primary and secondary settlement.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 17-11-21

Semester : I

Name of the Program: B.Tech. **Year:II** **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

Lesson No: 17 **Duration of Lesson:** 3 hr

Lesson Title: Direct Shear Test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Determine the shear strength of the soil.
2. Identify the shear strength parameters.

TEACHING AIDS : White Board, Marker, Lab Manual, and Demonstration.

TEACHING POINTS :

- In many engineering problems such as design of foundation, retaining walls, slab bridges, pipes, sheet piling, the value of the angle of internal friction and cohesion of the soil involved are required for the design.
- Direct shear test is used to predict these parameters quickly.
- The laboratory report covers the laboratory procedures for determining these values for cohesionless soils.

Assignment / Questions:

1. Define shear strength of a soil. Is it possible to tabulate the values of shear strength for different soils?

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 24-11-21

Semester : I

Name of the Program: B.Tech. **Year:**II **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: Vane Shear Test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Calculate shear strength of soils and identify the sensitivity of soils.
2. Outline the undrained and remoulded strength of soil.

TEACHING AIDS : White Board, marker, Lab Manual, and Demonstration

TEACHING POINTS :

- Where we cannot use tri-axial or unconfined tests, we make use of vane shear test, to find out shear strength of cohesive soils.
- The un-drained and remoulded strength of soil obtained from the test are useful for evaluating sensitivity of soil.
- This test is conducted to measure strength of low shear strength soils.

Assignment / Questions:

1. Derive the relation between torque and shear strength, when you have the overall diameter of vane and spring constant.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 1-12-21

Semester : I

Name of the Program: B.Tech. **Year:III** **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

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

Lesson Title: Unconfined Compressive Test

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Calculate unconfined compressive strength of soils
2. Identify the shear strength of soils.

TEACHING AIDS : White Board, marker, Lab Manual, and Demonstration

TEACHING POINTS :

- In this experiment soil specimen is consolidated under all round pressure in the tri-axial cell before failure is brought about by increasing major principal stress.
- This can be done with or without measurement of pore pressure.
- Useful to obtain the relation between shear strength, value of cohesion and angle of shearing resistance of a soil.

Assignment / Questions:

1. Derive the relation between shear strength, value of cohesion and angle of shearing resistance of a soil.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

LESSON PLAN

Academic Year : 2021-22 **Date:** 8-12-21

Semester : I

Name of the Program: B.Tech. **Year:III** **Section: B**

Course/Subject: Geotechnical Engineering Lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha

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

Lesson No: 20 **Duration of Lesson:** 3 hr

Lesson Title: Tri-axial Test (Demo)

INSTRUCTIONAL/LESSON OBJECTIVES:

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

1. Calculate shear strength and angle of internal friction.
2. Differentiate various drainage conditions and determine pore pressures.

TEACHING AIDS : White Board, marker, Lab Manual, and Demonstration

TEACHING POINTS :

- In this experiment soil specimen is consolidated under all round pressure in the tri-axial cell before failure is brought about by increasing major principal stress.
- This can be done with or without measurement of pore pressure.
- Useful to obtain the relation between shear strength, value of cohesion and angle of shearing resistance of a soil.

Assignment / Questions:

1. Derive the relation between shear strength, value of cohesion and angle of shearing resistance of a soil.

Signature of faculty

Note: Mention for each question the relevant Objectives and Outcomes Nos.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

COURSE COMPLETION STATUS

Academic Year : 2021-22

Semester : **I**

Name of the Program: B.Tech. **Year:**III **Section:** A

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Actual Date of Completion & Remarks, if any

Units	Remarks	No. of Objectives Achieved	No. of Outcomes Achieved
Exercise - I	Covered on time	1,2	1,2
Exercise –I	Covered on time	2,3	2,3
Exercise –II	Covered on time	3,4	3,4
Exercise - IV	Covered on time	4,5	4,5

Signature of HOD Signature of faculty

Date: Date:

Note: After the completion of each unit mention the number of Objectives & Outcomes Achieved.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

COURSE COMPLETION STATUS

Academic Year : 2021-22

Semester : **I**

Name of the Program: B.Tech. **Year:**III **Section: B**

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha K. S.

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

Actual Date of Completion & Remarks, if any

Units	Remarks	No. of Objectives Achieved	No. of Outcomes Achieved
Exercise - I	Covered on time	1,2	1,2
Exercise –I	Covered on time	2,3	2,3
Exercise –II	Covered on time	3,4	3,4
Exercise - IV	Covered on time	4,5	4,5

Signature of HOD Signature of faculty

Date: Date:

Note: After the completion of each unit mention the number of Objectives & Outcomes Achieved.

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

2021-22 BATCH STUDENT ROLL LIST

SECTION-A

S.No	Roll No	Name of student
1	18241A0151	SOHEB PATEL
2	18241A0152	SRIAM SHIVA ADITYA
3	19241A0101	RUHAIL AHMAD LONE
4	19241A0102	AITHA SAI TEJA
5	19241A0103	BARISETTY SHIVA KARTHIK
6	19241A0104	BENDHI VARUN THEJA GOUD
7	19241A0105	BHUKYA VAMSHI
8	19241A0106	BOGE VENKAT ROHITH
9	19241A0107	BONTHA PRANEETHKUMAR
10	19241A0108	CHILUKA RAHUL
11	19241A0109	DANDI KIRAN
12	19241A0110	DAYYA RAGNESH
13	19241A0111	E MANISHA GOUD
14	19241A0112	ERRAM SAI PRIYA
15	19241A0113	G DEEPIKA
16	19241A0114	GORANTALA SAI
17	19241A0115	GUGULOTHU SANTHOSH
18	19241A0116	GURIJALA SAI KUMAR
19	19241A0117	GURUJALA SRIDHAR
20	19241A0118	IRUVANTI HEMANTH KUMAR
21	19241A0119	JANGITI VYSHNAVI
22	19241A0120	JARUPLA CHERAN
23	19241A0122	JETTI SREEVANI
24	19241A0123	K SOWMYA
25	19241A0124	KADALI KRISHNASRI SAI
26	19241A0125	KAMAREDDY AKSHAY
27	19241A0126	KATTA SAI KUMAR
28	19241A0127	KOLLURI.TEJASWI
29	19241A0128	KONDAPURAM SRIJA
30	19241A0129	KOTTE VIVEK
31	19241A0130	KRUTHIKA VIJAY PALANGE
32	19241A0131	MADA AKHIL REDDY
33	19241A0132	MADARAM SHRAVAN KUMAR REDDY
34	19241A0133	MADDIGATLA AJAY SAGAR
35	19241A0134	CHANDANA MALPATEL
36	19241A0135	MANDALA CHINNI

37	19241A0136	MIREGILLA VIJAYAKUMAR
38	19241A0137	MOHD OBAID KASHIF
39	19241A0138	NARAPAKA MADHAV KUMAR
40	19241A0139	NIMMALA ARSHITHA
41	19241A0141	P SIDDARTHA
42	19241A0142	PAGIDIPALLY AJAY KUMAR
43	19241A0143	PALLAPU NAVEEN
44	19241A0144	PALLE SANATH KUMAR
45	19241A0145	PANTANGI PRANAY
46	19241A0146	PATIL SWAPNIL
47	19241A0147	POLISETTY SAAHAS
48	19241A0148	S.SAITEJA
49	19241A0149	SAI NEERAJ M
50	19241A0150	SATYA SAI PRASANNA REDDY SOLIPETA
51	19241A0151	SHAIK BILAL
52	19241A0152	SHAIK FIRDOUS AYESHA
53	19241A0153	SOORA VIKAS
54	19241A0154	TELLAM SRI SAI PAVANA ROSHINI
55	19241A0155	THALLAPALLY SWARANYA
56	19241A0156	THUMATI VENKATA VAYUNANDHAN
57	19241A0157	UDUMULA NIKHIL REDDY
58	19241A0158	VELISHALA GAYATHRI
59	19241A0159	VENKATA SIDDHARTHA RAJU VEGESNA
60	19241A0160	YASWANTH KURUVA
61	19245A0101	KANCHERLA BHARATH
62	19245A0102	ELUPULA KUMARASWAMY
63	19245A0103	BRAHMADEVARA BHAVITHA
64	19245A0104	DASARI NAMRATHA
65	19245A0105	T CHANDANA
66	19245A0106	KOLA HARITHA

SECTION-B

S.No	Roll No	Name of student
1	19241A0161	ABDUL RAHEEM
2	19241A0162	ANEMONI MURALI MANOHAR
3	19241A0163	ASKANY HARISH SAGAR
4	19241A0164	BODLA AKSHITH
5	19241A0165	BURRA VAMSHI KRISHNA
6	19241A0166	CHERLAKOLA AKHILA
7	19241A0167	CHINTAPALLI VIKRAM
8	19241A0168	CHIRRIBOYINA DHANYA
9	19241A0169	D SREE MADHURI
10	19241A0170	GADDAM SAHITHI
11	19241A0171	GAJALA SUKENDHAR REDDY
12	19241A0172	YASHASWI GANGAVARAM
13	19241A0173	GINDHAM ADITYA KUMAR
14	19241A0174	GUDHETI NARENDAR REDDY
15	19241A0175	GUMMAPUR SAI PRATEEK REDDY
16	19241A0176	HANMAPUR DHEERAJ GOUD
17	19241A0177	JAVVAJI AISHWARYA
18	19241A0178	JULAPALLY NITHIN RAO
19	19241A0179	K NAVEEN
20	19241A0180	K RAJESHWARI
21	19241A0181	kachava SURENDAR
22	19241A0182	KODATHALA INDU
23	19241A0183	KOTARU SRINIVASA VARAPRASAD
24	19241A0184	MALOTH RAHUL
25	19241A0185	MATURI SATHVIK
26	19241A0186	MOHAMMED ABDUL MAAJID
27	19241A0187	MEDARI DAYANA
28	19241A0188	NARSINGA SANDEEP
29	19241A0189	PALANATI ROHITH
30	19241A0190	PURALASETTY BHAVANA
31	19241A0191	RODDA MALAVIKA REDDY
32	19241A0192	SAPRAM NAGA SRILOWKYA MUKTHA
33	19241A0193	SHAIK PARVEZ ANSARI
34	19241A0194	SIDDELA THARUN KUMAR
35	19241A0195	TALARI CHANDANA SREE
36	19241A0196	VALLEPU KALYAN
37	19241A0197	VRASHAB PATEL
38	19241A0198	YELLAVULA NARENDER
39	19241A0199	BADDELA SAITHARUN YADAV
40	20245A0101	AAMANCHI BOWMI
41	20245A0102	A SAI CHAITHANYA
42	20245A0103	BAIRY B S ANIRUDH
43	20245A0104	DADDU TEJASREE
44	20245A0105	DOPATHI RAVITEJA
45	20245A0106	ERUVENTI NIHARIKA
46	20245A0107	GADDAMIDI AANIL
47	20245A0108	GANDLA RISHIK RAJ

48	**20245A0109**	**GONE NAVEEN KUMAR**
49	**20245A0110**	**KOTA VISHAL**
50	**20245A0111**	**KUMMARI MAHESH**
51	**20245A0112**	**LAKAVATH ANIL**
52	**20245A0113**	**MADAVARAM ROHITH**
53	**20245A0114**	**MANDALA AKSHITHA**
54	**20245A0115**	**MANJUNATH P**
55	**20245A0116**	**PORANDLA NAGABHUSHANAM**
56	**20245A0117**	**PULISHETTY BHAVANI**
57	**20245A0118**	**RACHA KRANTHI RANADEER**
58	**20245A0119**	**S MANOJ KUMAR**
59	**20245A0120**	**SAMUDRALA MANIDEEP**
60	**20245A0121**	**SANGEPAGA GOUTHAM**
61	**20245A0122**	**SODADASI RAHUL**
62	**20245A0123**	**VANGA HARSHITH**
63	**20245A0124**	**CHOLETI VINEETHA**
64	**20245A0125**	**GANGULA GRISHMA**
65	**20245A0126**	**BOLLAMPALLI SAI POOJITH**
66	**20245A0127**	**PAMULAPATI SUMANTH**
67	**20245A0128**	**T SANGHAMITHRA**
68	**20245A0129**	**AMBEDA AKANKSHA**
69	**20245A0130**	**DOPPALAPUDI RAMVINEETH SAI**
70	**20245A0131**	**PILLY UDAY KIRAN**

Signature of HOD

Date:

Signature of faculty

Date:

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

GUIDELINES TO STUDY THE COURSE SUBJECT

Academic Year : 2021-22

Semester : **I**

Name of the Program: B.Tech. **Year:**III **Section:** A / B

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

Guide line to study the course/subject: Geotechnical Engineering Lab

This course helps the students to learn and understand, with the concept of "soil" as an engineering material, the index and engineering properties and methods used to characterize soil for Geotechnical analysis and design.

So the students should have the following prerequisites:

- Basic knowledge of mathematics, science, engineering and fluid mechanics
- Strength of Materials and Basics and applied soil mechanics
- Ability to perform exercise as well as analyze and interpret data.

Where will this subject help?

- To understand the interaction between water and soil and the effects of static vs. flowing water on soil strength.
- To understand the fundamental differences between behaviors of sands and clays and between total and effective stresses.
- To become familiar with common laboratory tests to classify soils and characterize index and engineering properties of soil.

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Department of Civil Engineering

BOOKS AND MATERIALS

Text Books	
1.	Geotechnical Engineering Lab Manual
2.	Basic and Applied Soil Mechanics by Gopal Ranjan & A. S. R. Rao, New Age International Pvt. Ltd. New Delhi.
3.	Soil Mechanics and foundation engineering by K.R. Arora, Standard Publishers and Distributers, Delhi.

Suggested / Reference Books	
6.	Geotechnical Engineering by C. Venkataramiah, New Age International Pvt. Ltd, (2002)
7.	Soil Mechanics by B.M. Das

Web Sites	
8.	https://www.youtube.com/watch?v=pM-w_cvk1nA https://www.youtube.com/watch?v=5rDHjZ_RJq0 https://www.youtube.com/watch?v=CAezS3mPzOc https://www.youtube.com/watch?v=c4i_y6u-tsE

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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
EVALUATION STRATEGY

Academic Year : 2021-22

Semester : **I**

Name of the Program: B.Tech. **Year:**III **Section:** A / B

Course/Subject: Geotechnical Engineering lab **Course Code:** GR18A3010

Name of the Faculty: G.Swetha/ T.Jahnavi /G.Manisha **Department:** Civil Engineering

Designation: Assistant Professor

1. TARGET:
   a) Percentage for pass: 100%
   b) Percentage of class:

First class with distinction	65
First class	59
Pass class	6
Total strength	130

2. **COURSE PLAN & CONTENT DELIVERY**

- 78 to 156 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.

- Introducing new experiments relating to soil design parameters.

Signature of HOD
Date:

Signature of faculty
Date:

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Assessment in relation to CO's and COB's

Assessment:

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

GR18A3010/ Geotechnical Engineering lab	**Course Outcomes**				
Assessments	1	2	3	4	5
1					
2	X	X	X	X	X
3	X	X	X	X	X
4	X	X	X	X	X
5	X	X	X	X	X

GR18A3010/ Geotechnical Engineering lab	**Course Objectives**				
Assessments	1	2	3	4	5
1					
2	X	X	X	X	X
3	X	X	X	X	X
4	X	X	X	X	X

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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				
2		X			
3			X		
4				X	
5					X

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

P-Outcomes / C-Outcomes	A	B	C	D	E	F	G	H	I	J	K	L	PSO1	PSO 2
1	M	H	H									H	M	H
2	M			M					M			H	M	M
3	H	M							H	M	M			M
4	H	M						H	M	M		M		H
5	H	H		H				M	M	M			M	H

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

Program Outcomes / Course Objectives	a	b	c	d	e	f	g	h	i	j	k	l	Pso1	Pso2
1	x	x		x						x		x	x	x
2	x	x		x								x	x	x

3	x	x		x				x				x	x	x
4	x	x						x	x	x			x	x
5	x	x						x	x	x		x	x	x

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

Program Outcomes / Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	Pso1	Pso2
1	x	x		x						x		x		
2	x	x		x								x		
3	x	x		x				x				x		
4	x	x						x	x	x				
5	x	x						x	x	x		x		

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

Course: Geotechnical Engineering Lab

Program Outcomes / Courses	a	b	c	d	e	f	g	h	i	j	k	l	Pso1	Pso2
1	x	x		x				x	x	x		x		

Program Educational Objectives (PEOs) - Course Outcomes Relationship Matrix

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

Rubric Template – Geotechnical Engineering Lab

Academic Year : 2021-22 **Semester:**I

Name of the Program: B.Tech **Year:** III Year **Section:** A / B

Course/Subject : Geotechnical Engineering Lab **Course Code** : GR18A3010

Name of the Faculty : G.Swetha/ T.Jahnavi /G.Manisha

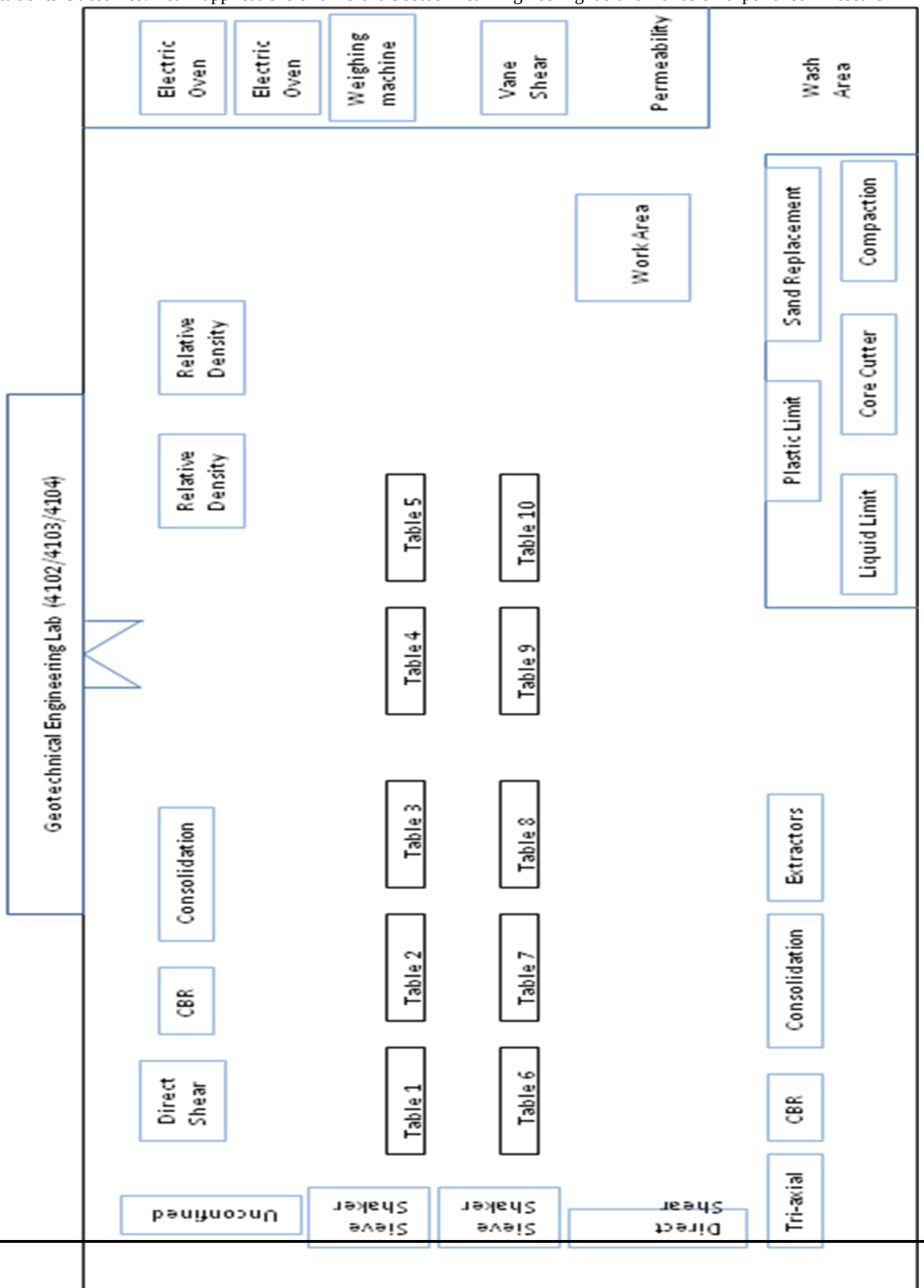
Designation: Assistant Professor **Department:** Civil Engineering

		Beginning	Developing	Reflecting Development	Accomplished	Exemplary	Score
Roll no of the Student	**Performance Criteria**	**1**	**2**	**3**	**4**	**5**	
202450101	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 soil and assessment using appropriate laboratory analysis.	Low level of knowledge on soil properties and the respective laboratory analyses.	Able to understand the importance of vital soil parameters and effecting factors.	Ability to apply the knowledge of soil properties in choosing appropriate laboratory analysis	Full Knowledge on properties of soil and assessment of vital parameters using laboratory analyses.	Analyzing all practical aspects of soil properties and their key role in the field of construction.	5
	Level of knowledge on strength parameters of soil and their real time applications.	Low level of knowledge on strength parameters of soil and their real time applications.	Able to understand the strength parameters of soil under various loading conditions.	Ability to apply the knowledge in the determination of strength parameters of soil	Full knowledge on strength parameters of soil and the respective laboratory analyses.	Analyzing the importance of strength parameters of soil under various existing conditions and their respective applications.	4

	Level of knowledge in Reporting the results of a laboratory experiment at a professional standard.	Low level of knowledge on strength parameters of soil and their real time applications.	Able to understand the strength parameters of soil under various loading conditions.	Ability to apply the knowledge in the determination of strength parameters of soil	Full knowledge on strength parameters of soil and the respective laboratory analyses.	Analyzing the importance of strength parameters of soil under various existing conditions and their respective applications.	4
	Level of knowledge in Recommending extensive research in geotechnical properties.	Low level of knowledge on strength parameters of soil and their real time applications.	Able to understand the strength parameters of soil under various loading conditions.	Ability to apply the knowledge in the determination of strength parameters of soil	Full knowledge on strength parameters of soil and the respective laboratory analyses.	Analyzing the importance of strength parameters of soil under various existing conditions and their respective applications.	5

Objectives: To learn theory and practical aspects of Geotechnical engineering lab

Students Outcomes: Learn applications of different Geotechnical Engineering lab and Hands on experience in research



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Department of Civil Engineering

Geotechnical Engineering Lab

Internal Examination Model Question Paper

1. Determine the boundary water content of the given soil mass between liquid state and plastic state.

2. Determine the boundary water content at which the given soil mass changes from plastic state to the semi-solid state.

3. Determine the in-situ bulk density of the soil mass by taking core sample.

4. Determine the in-situ bulk density of the soil mass by replacing sand with soil.

5. Determine the gradation of the given soil mass.

6. Determine the bulk density at given water content of 8% using standard compaction test apparatus.

7. Determine the coefficient of permeability by constant head test method.

8. Determine the coefficient of permeability by variable head test method.

9. Determine the bearing ratio of the given sub-grade soil mass by light compaction.

10. Determine the time taken for 90% consolidation for the given soil mass.

11. Determine the time taken for 50% consolidation for the given soil mass.

12. Determine the shear stress for the given soil mass at a normal stress of 0.5 kg/cm^2.

13. Determine the shear strength of the soil mass using the spring constant 4 kg-cm.

14. Determine the shear strength of the soil mass using the spring constant 2 kg-cm.

15. Determine the unconfined compressive strength of the soil mass.

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Bachupally, Kukatpally, Hyderabad - 500090

PRACTICAL EXAMINATION ANSWER BOOK INTERNAL

No. ... 29677

H.T. No.	1	9	2	4	1	A	0	1	8	2

Name of the Examination GTE lab Internal Examination

Course 3rd B-Tech 1st Sem Branch CIVIL-B Date 02/Dec/2021

Signature of the Invigilator

9/10

START WRITING FROM HERE

10) Determine the shear stress for the given soil mass at a normal stress of 0.5kg/cm^2.

AIM:

To determine the shearing stress (strength) of a given soil sample by 'Direct shear Test'.

APPARATUS:

1) Direct shear box
2) Tamper
3) Aluminium Container
4) Proving Ring
5) Dial guage
6) Spatula
7) Balancing machine

PROCEDURE:

1) At first, we have to take 200gms of soil sample to determine shear strength.

2) Add 14% of water content to 200gms of soil and mix it well.

3) Divide the soil sample into three parts.

4) Now, take the sampler box and add one layer or part of soil sample.

5) We have to give 25 blows with tamper and add second part.

6) Again repeat the process and add third layer of remaining soil sample & give 25 blows.

7) Now, we have to remove the soil sample from sampler gently without any cracks in the sample.

8) Place the sample in direct shear box.

9) first, we have to place the base plate and then place the grid line plate.

10) Now, place the soil sample on grid plate and again cover with another grid line plate oppositively to first grid line plate.

11) finally keep the cover plate and ball on the plate and keep the entire direct shear box on machine.

12) The vertical load and horizontal load will apply on the shear box.

13) After some time, we may see that proving ring value will stop or move slowly to and fro.

14) Then we should note down the proving ring value.

OBSERVATIONS:

Least count of proving ring : 0.3797

Area of Sample : $6 \times 6 = 36 cm^2$

Normal stress : $0.5 kg/cm^2$

TABULAR COLUMN:

S.NO	Normal Stress (kg/cm^2)	Proving ring reading (kg)	Shear load = Proving ring reading x L.C (kg)	Shear stress = Shear load / Area of Samples (kg/cm^2)
01	$0.5 kg/cm^2$	15.3	5.81 kg	$0.16 kg/cm^2$
02	$1 kg/cm^2$	20.2	7.67 kg	$0.21 kg/cm^2$
03	$1.5 kg/cm^2$	25.6	9.72 kg	$0.27 kg/cm^2$

CALCULATIONS:

Normal stress $= 0.5 kg/cm^2$

Proving ring reading $= 15.3 kg$

Shear load = Proving ring reading x least count

$= 15.3 \times 0.3797$

$$\text{Shear stress} = \frac{\text{Shear load}}{\text{Area of Sampler}}$$

$$= \frac{5.81}{36}$$

Shear stress $= 0.16 \text{ kg/cm}^2$

Normal stress $= 1 \text{ kg/cm}^2$

Shear stress $= 0.21 \text{ kg/cm}^2$

Normal stress $= 1.5 \text{ kg/cm}^2$

Shear stress $= 0.27 \text{ kg/cm}^2$

RESULT:

The parameters of given soil sampler are $c = 1 \text{ kg/cm}^2$ and $\phi = 23^\circ$.

Where, c and ϕ are the parameters of shear strength.

——END——

Kodathala Indu (19941A0182)

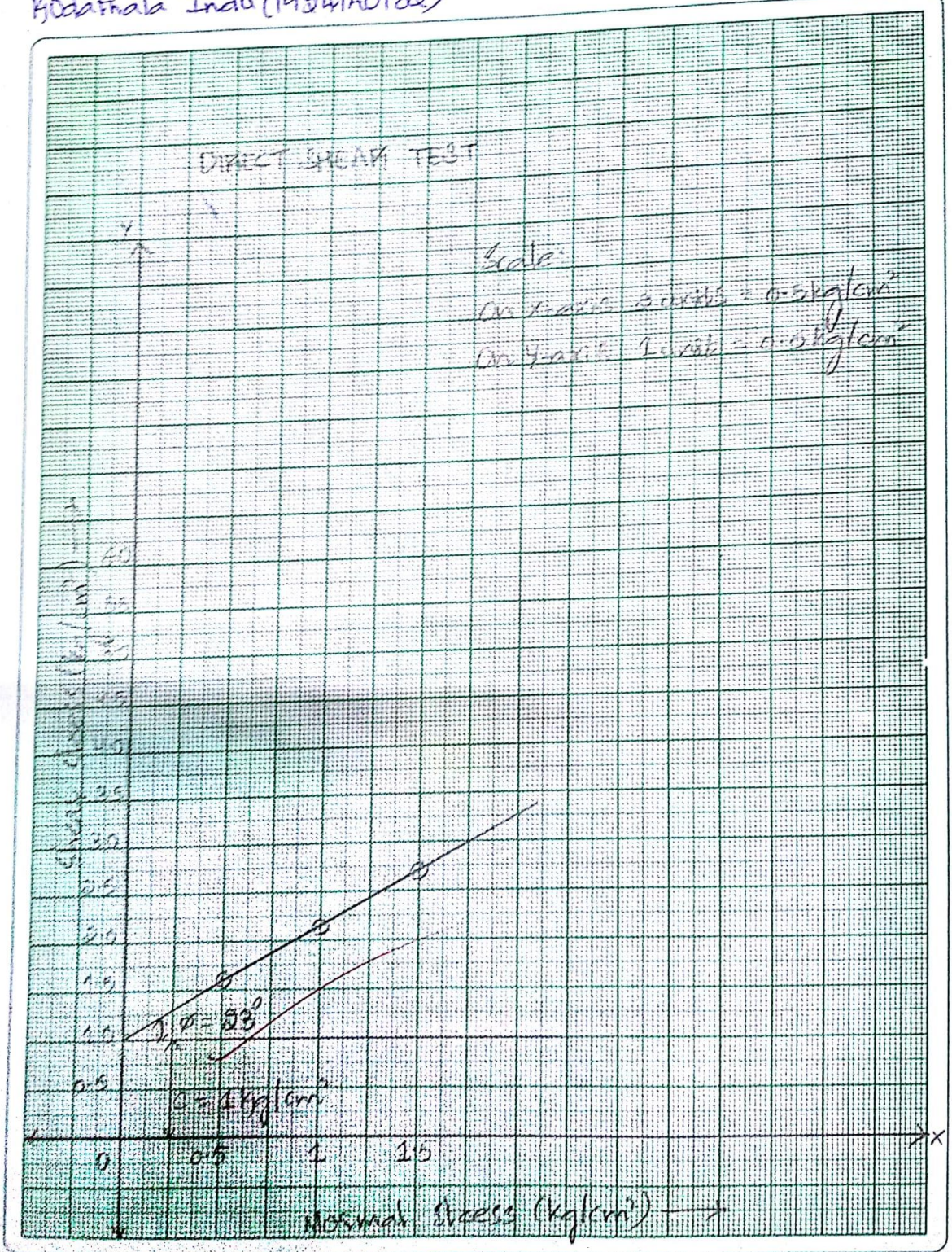
Page No.

DIRECT SHEAR TEST

Scale:

On x-axis: 3 units = 0.5 kg/cm²

On y-axis: 1 unit = 0.5 kg/cm²



VENKATESWARA

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I II **MID TERM EXAMINATION**

M. Ayub

No. 378276

H.T. No. 1 9 2 4 1 A 0 1 3 3

Name of the Examination III. BTech. I SEM, ~~II-I~~ ~~EXAM~~ LAB INTERNAL EXAM

Course B. Tech Branch Civil Date

Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS													

START WRITING FROM HERE

Q1)

Aim:- To ~~the~~ determine the liquid limit of ~~Samp~~ ~~so~~

5/10

Apparatus:-

* grooving tool
* Soil
* water
* Liquid ~~tool~~ limit equipment

Procedure :-

* Take 120gms of soil and sieve in 425 mm micron sieve.
* Take water and add water in soil. make a paite of soil.
* Apply the paste in the liquid limit tool fully., the grooving tool should be weight 300gm.
* Remove the paite of 10cm in the in the middle of liquid limit tool, until the bottom
* Now, we should do tapping. until it come we should not liquid rotate the key of liquid limit tool
* Now, we should rotate the key and its starts tapping.

* ~~Approx~~ of it starts the rotation of per minute. per minutes. the middle gap should be attached while tapping.

* Approx 80 to 85 we get the result. Now, we the soil sample into ~~4 cont 4 to 4 conts~~ 4 containers - ~~we~~ we ~~the~~ ~~sho~~ take the weight of each container. ~~we shorted~~ & keep

* Fill each container with soil sample ~~entire~~ ~~it becomes~~ and keep it oven. we ~~show~~ keep in ~~oven~~ ~~for~~ ~~to~~ ~~oven for~~ oven for 24 to 48 ~~hour hours~~ ~~for the for for~~ the ~~so~~ results.

Observation table

S NO.	~~Container~~ Sample 1	~~Container~~ sample 2	Sample 3	Sample 4
NO of containers				
~~NO~~ NO of tappings				
weight of soil + water				
weight of dry soil + water				
weight of soil				

Calculation :

No of tappings =

No of containers =

Results :-

the Liquid limit of soil given soil sample is ____ %.

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Bachupally, Kukatpally, Hyderabad - 500090

PRACTICAL EXAMINATION ANSWER BOOK INTERNAL

No. 29764

H.T. No.	1	9	2	4	1	A	0	1	3	9

Name of the Examination III B.Tech I semester

Course Geotechnical Engg lab Branch civil Engg-A Date 1/12/21

Signature of the Invigilator

START WRITING FROM HERE

3. Determine the in-situ bulk density of the soil mass by taking core sample

9/10

Aim: To determine the in-situ bulk density of the soil mass by taking core sample

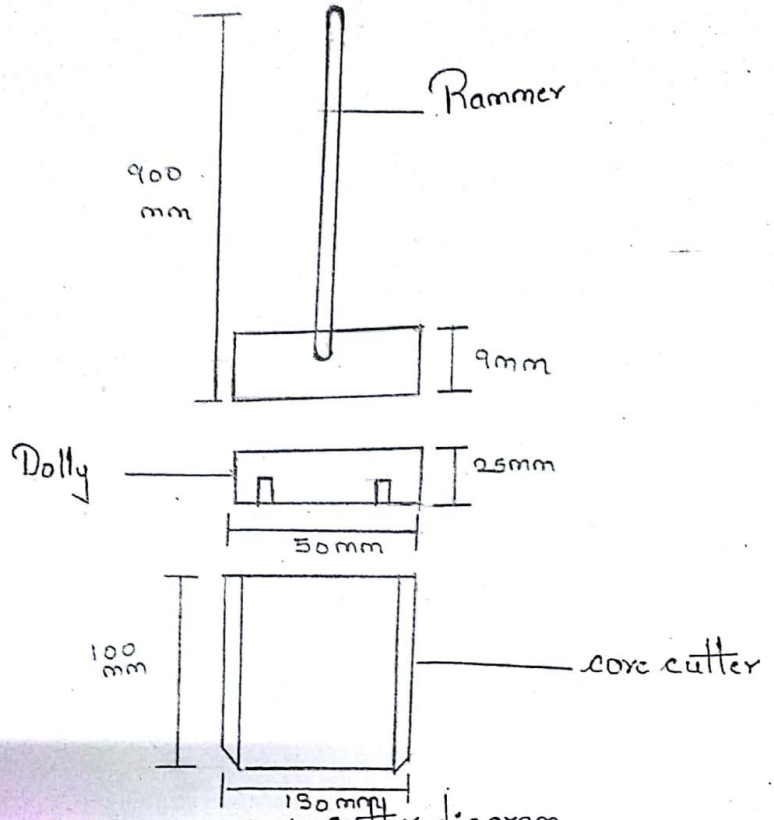
Need of the scope:

To find bulk density of the soil mass which is fulled for roads, air field, The bulk density of the soil mass is used know the purpose for construction like roads, field. mainly use for construction of roads & for field work.

Apparatus:

1. core cutter apparatus internal diameter 100mm height of internal diameter 130mm
2. Dolly internal diameter 25mm & height of the dolly 50mm
3. Rammer internal diameter (4mm) 9kg from foot of the height of rammer 900mm
4. Take accuracy 1kg
5. Patele knife
6. steel rule

7. weight balance.



core cutter diagram

Procedure:

1. Measure the weight of core cutter on the weight balance machine
2. Measure the inner height of core cutter on the weight balance machine
3. Select the place fix the core cutter on the ground keep the dolly on core cutter
4. Hit core cutter with Rammer till it goes 15mm
5. Dig the ~~sand~~ place around core cutter take out the core cutter carefully.
6. check the mass of soil core cutter m_2
7. (m_1) mass of empty core cutter on weight balance machine
8. Note down the values
9. Repeat up to 3 samples take down the average of 3 Results.

Table: calculation of bulk density of the soil mass

Inner diameter of core cutter	10cm
Inner height of core cutter	12.8^{5}cm
mass of empty core cutter (m_1)	1092.5 1082gm
mass of soil core cutter (m_2)	~~1184~~ 1602.5
mass of core cutter ($m_1 - m_2$)	2763gm
volume of soil	$1005.300 cm^2$
water content %	~~10.43~~ 10%
Bulk Density	1.59%
Dry density ($B/1+w$)	1.49

Specific calculation

volume $= \frac{\pi}{4} \times d^2 = 12.85$ $\frac{\pi}{4} \times 10^2 = 12.5$

$\frac{\omega_2 - \omega_3}{\omega_3 - \omega_1} \times 100 = 10\%$

Bulk density

$\frac{m}{v} = \frac{1602.5}{1005.30} = 1.59$ g/cc

dry density $= \frac{\gamma d}{1+w}$ $= \frac{1.59}{1+10.43}$ $= 01445$ gm/cc

Result: The in-situ bulk density of the soil mass by taking core sample $= 0.1459$ m/cc