



**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING  
(AUTONOMOUS)**

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution  
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada  
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.  
Phone: 08659-222933, Fax: 08659-222931

**DEPARTMENT OF CIVIL ENGINEERING**

**COURSE HANDOUT**

**PART-A**

<b>Name of Course Instructor</b>	: J.RANGAIAH	
<b>Course Name &amp; Code</b>	: H&HMS	<b>Regulation:</b> R20
<b>L-T-P Structure</b>	: 3-0-0	<b>Credits:</b> 3
<b>Program/Sem/Sec</b>	: II B.TECH./II SEM	<b>A.Y.:</b> 2021-22

**PREREQUISITE:** Applied Mechanics, Mechanics of Fluids

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** The course allows the student to get insight into open channel hydraulics, and the various theories dealing with the flow phenomenon of fluid in an open channel. The student is exposed to the basics, components, and working of the hydro machinery, applications of different types of turbines and pumps.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Understand the various types of flows, specific energy curves, hydraulic jumps and working of hydraulic machines in fluid flows. (Understand-L2)
<b>CO2</b>	Apply the basic principles to design the open channels and determine the energy losses due to formation of hydraulic jump. (Apply-L3)
<b>CO3</b>	Apply the impulse-momentum equation to determine the force exerted by a jet on different configurations of vanes. (Apply-L3)
<b>CO4</b>	Apply the working principle to draw the velocity triangles and determine the efficiencies of hydraulic machines.(Apply-L3)

**COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	-	-	-	-	-	-	-	-	-	-	-	2	1	-
<b>CO2</b>	3	-	-	-	-	-	-	-	-	-	-	-	2	1	-
<b>CO3</b>	3	-	-	-	-	-	-	-	-	-	-	-	2	1	-
<b>CO4</b>	3	-	-	-	-	-	-	-	-	-	-	-	2	1	-
	<b>1 - Low</b>			<b>2 -Medium</b>						<b>3 - High</b>					

**TEXT BOOKS**

1. R.K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Machines", Laxmi Publications (p) Ltd.
2. R.K. Rajput "Textbook of Fluid Mechanics and Hydraulic Machinery", Revised edition, S. Chand & Company, Ltd., New Delhi, 2005.

**REFERENCES**

1. A.K. Jain, Fluid Mechanics 2nd edition, Khanna Publishers, Delhi.2001 revised edition, Standard Book Home, New Delhi, 2005.
2. P.N. Modi, and S.M. Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Rajsons Publications Pvt Ltd., Standard Book House, New Delhi, 2009.
3. K.R. Arora, "Fluid Mechanics, Hydraulic and Hydraulic Machines", Standard Publishers and Distributors, New Delhi, 2005.

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN)

#### UNIT – I: UNIFORM FLOW

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Review of basics	1	07-03-2022		TLM1	
2.	Introduction to open channel flow, Classification of flows in channels.	1	08-03-2022		TLM1	
3.	Chezy, manning's, bazin, Kutter's formulae	1	09-03-2022		TLM1	
4.	Most economical Rectangular Sections	1	09-03-2022		TLM1	
5.	Problems	1	14-03-2022		TLM3	
6.	Most economical Trapezoidal Sections	1	15-03-2022		TLM1	
7.	Problems	1	16-03-2022		TLM1	
8.	Problems	1	16-03-2022		TLM1	
9.	Most economical Circular sections-	1	19-03-2022		TLM1	
10.	Problems	1	21-03-2022		TLM3	
11.	Problems	1	22-03-2022		TLM1	
12.	Problems	1	23-03-2022		TLM1	
<b>No. of classes required to complete UNIT-I: 12</b>				<b>No. of classes taken:</b>		

#### UNIT – II: NON – UNIFORM FLOW

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Specific energy curves; - critical depth, critical velocity, minimum Specific energy	1	26-03-2022		TLM1	
2.	Problems	1	28-03-2022		TLM3	
3.	Critical flow in rectangular channels	1	29-03-2022		TLM1	
4.	Problems	1	30-03-2022		TLM1	
5.	Gradually Varied Flow: Dynamic equation	1	30-03-2022		TLM1	
6.	Problems	1	04-04-2022		TLM3	
7.	Surface Profiles; Computation of surface profiles by single step method	1	06-04-2022		TLM1	
8.	Back water Curves and Draw down curves	1	06-04-2022		TLM1	
9.	Problems	1	11-04-2022		TLM3	
10.	Hydraulic jump Types of hydraulic jumps; Location and applications of hydraulic jump	1	12-04-2022		TLM1	
11.	Energy loss in a hydraulic jump.	1	13-04-2022		TLM1	

12.	Problems	1	13-04-2022		TLM1	
<b>No. of classes required to complete UNIT-II: 12</b>				<b>No. of classes taken:</b>		

### UNIT-III: BASICS OF TURBO MACHINERY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Stationary flat, inclined and curved vanes,	1	16-04-2022		TLM1	
2.	Problems	1	18-04-2022		TLM3	
3.	Moving flat, inclined vanes,	1	19-04-2022		TLM1	
4.	Problems	1	20-04-2022		TLM1	
5.	Moving curved vanes,	1	20-04-2022		TLM1	
6.	Problems	1	23-04-2022		TLM1	
7.	Problems	1	02-05-2022		TLM3	
8.	Jet striking centrally and at tip	1	04-05-2022		TLM1	
9.	Velocity triangles at inlet and outlet	1	04-05-2022		TLM1	
10.	Expressions for work done and efficiency	1	07-05-2022		TLM1	
11.	Problems	1	09-05-2022		TLM3	
12.	Problems	1	10-05-2022		TLM1	
13.	Angular momentum principle	1	11-05-2022		TLM1	
<b>No. of classes required to complete UNIT-III: 13</b>				<b>No. of classes taken:</b>		

### UNIT-IV: HYDRAULIC TURBINES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Layout of a typical Hydropower installation – Heads and efficiencies - classification of turbines	1	11-05-2022		TLM1	
2.	Pelton wheel	1	13-05-2022		TLM1	
3.	Problems	1	16-05-2022		TLM3	
4.	Problems	1	17-05-2022		TLM1	
5.	Francis turbine	1	18-05-2022		TLM1	
6.	Problems	1	18-05-2022		TLM1	
7.	Kaplan turbine	1	21-05-2022		TLM1	
8.	Problems	1	23-05-2022		TLM3	
9.	Draft tube – theory and efficiency	1	24-05-2022		TLM1	

10.	Problems	1	25-05-2022		TLM1
11.	Specific turbines	1	25-05-2022		TLM1
12.	Unit speed - unit quantity - unit power	1	28-05-2022		TLM1
13.	Problems	1	30-05-2022		TLM3
14.	Specific speed characteristics-geometric similarity-cavitation	1	31-05-2022		TLM1
<b>No. of classes required to complete UNIT-IV: 14</b>				<b>No. of classes taken:</b>	

#### UNIT-V: PUMPS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Centrifugal Pumps: Classification, work done, , losses and efficiencies,	1	01-06-2022		TLM1	
2.	Minimum starting speed, specific speed	1	01-06-2022		TLM1	
3.	Multistage pumps	1	04-06-2022		TLM1	
4.	Problems	1	06-06-2022		TLM3	
5.	Specific speed, characteristic curves,	1	07-06-2022		TLM1	
6.	NPSH, Cavitation in pumps	1	08-06-2022		TLM1	
7.	Reciprocating Pumps: Types, working, Work done	1	08-06-2022		TLM1	
8.	Problems	1	13-06-2022		TLM3	
9.	Problems	1	14-06-2022		TLM1	
10.	Coefficient of discharge and slip	1	15-06-2022		TLM1	
11.	Effects of acceleration and frictional resistance	1	15-06-2022		TLM1	
12.	Indicator diagrams, separation	1	18-06-2022		TLM1	
<b>No. of classes required to complete UNIT-V: 12</b>				<b>No. of classes taken:</b>		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**EVALUATION PROCESS (R20 Regulation):**

<b>Evaluation Task</b>	<b>Marks</b>
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))</b>	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
<b>Total Marks = CIE + SEE</b>	<b>100</b>

**PART-D****PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

<b>PEO 1</b>	To possess knowledge in both fundamental and application aspects of mathematical, scientific, engineering principles to analyze complex engineering problems for meeting the national and international requirements and demonstrating the need for sustainable development.
<b>PEO 2</b>	To adapt to the modern engineering tools for planning, analysis, design, implementation of analytical data and assess their relevant significance in societal and legal issues necessary in their professional career.
<b>PEO 3</b>	To exhibit professionalism, ethical attitude, communication, managerial skills, team work and social responsibility in their profession and adapt to current trends by engaging in continuous learning.

**PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problem
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent

	and life-long learning in the broadest context of technological change.
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**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	Possesses necessary skill set to analyze and design various systems using analytical and software tools related to civil engineering.
<b>PSO 2</b>	Possesses ability to plan, examine and analyse the various laboratory tests required for the professional demands.
<b>PSO 3</b>	Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
Name of the Faculty	J.Rangaiah	J.Rangaiah	J.Rangaiah	Dr.V.Ramakrishna
Signature				



## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### UNIT-I: Types and physical properties of soil

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to GTE	1	07-03-2022		TLM1	
2.	Types of soils based on origin	1	09-03-2022		TLM1	
3.	Physical properties of soils and introduction to 3-phase diagram	1	10-03-2022		TLM1	
4.	Basic definitions and Tutorial	1	11-03-2022		TLM3	
5.	Relationships among basic definitions	1	14-03-2022		TLM1	
6.	Problems	1	16-03-2022		TLM1	
7.	Problems	1	17-03-2022		TLM1	
8.	Field identification of soil and problems	1	21-03-2022		TLM1	
9.	Classification of soils based on grain size distribution	1	23-03-2022		TLM4	
10.	Hydrometer analysis and Problems	1	24-03-2022		TLM4	
11.	Problems and Tutorial	1	25-03-2022		TLM3	
<b>No. of classes required to complete UNIT-I: 10</b>				<b>No. of classes taken:</b>		

#### UNIT-II: Consistency and plasticity characteristics of soil and Soil compaction

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Consistency limits explanation	1	28-03-2022		TLM1	
2.	Determination of LL, PL and SL	1	30-03-2022		TLM4	
3.	Plasticity characteristics of soil	1	31-03-2022		TLM1	
4.	Problems and Tutorial	1	01-04-2022		TLM3	
5.	Problems	1	04-04-2022		TLM1	
6.	Laboratory methods of compaction of soils	1	06-04-2022		TLM4	
7.	Field compaction methods and factors affecting compaction of soil	1	07-04-2022		TLM1	
8.	Field compaction control and Tutorial	1	08-04-2022		TLM3	
9.	Problems	1	11-04-2022		TLM1	
<b>No. of classes required to complete UNIT-II: 8</b>				<b>No. of classes taken:</b>		

#### UNIT-III: Permeability characteristics of soil and Concept of effective stress in soils

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Darcy's law and laboratory determination of permeability of cohesionless and cohesive soils	1	13-04-2022		TLM4	
2.	Factors affecting permeability and Problems	1	18-04-2022		TLM1	
3.	Problems	1	20-04-2022		TLM1	
4.	Permeability of layered soil deposits and Problems	1	21-04-2022		TLM1	
5.	Problems and Tutorial	1	22-04-2022		TLM3	
6.	Terzaghi's effective stress concept	1	02-05-2022		TLM1	
7.	Problems	1	04-05-2022		TLM1	
8.	Problems	1	05-05-2022		TLM1	
9.	Problems and Tutorial	1	06-05-2022		TLM3	
10.	Quick sand condition	1	09-05-2022		TLM1	



11.	Problems	1	11-05-2022		<b>TLM1</b>
<b>No. of classes required to complete UNIT-III: 10</b>				<b>No. of classes taken:</b>	

#### UNIT-IV: Shear strength of soils

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Analysis of shear failure	1	12-05-2022		<b>TLM1</b>	
2.	Mohr's circle and Tutorial	1	13-05-2022		<b>TLM3</b>	
3.	Mohr's coulomd failure theory	1	16-05-2022		<b>TLM1</b>	
4.	Direct shear test and Triaxial test	1	18-05-2022		<b>TLM4</b>	
5.	UCC test and Vane shear test	1	19-05-2022		<b>TLM4</b>	
6.	Problems and Tutorial	1	20-05-2022		<b>TLM3</b>	
7.	Problems	1	23-05-2022		<b>TLM1</b>	
8.	Problems	1	25-05-2022		<b>TLM1</b>	
9.	Problems	1	26-05-2022		<b>TLM1</b>	
10.	Advantages of tests and Tutorial	1	27-05-2022		<b>TLM3</b>	
11.	Revision	1	30-05-2022		<b>TLM1</b>	
<b>No. of classes required to complete UNIT-IV: 10</b>				<b>No. of classes taken:</b>		

#### UNIT-V: Stress distribution in soils and Compressibility characteristics of soils

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Boussinesq's theory for point load	1	01-06-2022		<b>TLM1</b>	
2.	Boussinesq's theory for other loads	1	02-06-2022		<b>TLM1</b>	
3.	Westergaard's theory and Tutorial	1	03-06-2022		<b>TLM3</b>	
4.	Approximate methods and Problems	1	06-06-2022		<b>TLM1</b>	
5.	Problems	1	08-06-2022		<b>TLM1</b>	
6.	Terzaghi's theory of consolidation	1	09-06-2022		<b>TLM1</b>	
7.	Consolidometer test and Tutorial	1	10-06-2022		<b>TLM3</b>	
8.	Calculation of consolidation settlement	1	13-06-2022		<b>TLM1</b>	
9.	Problems	1	15-06-2022		<b>TLM1</b>	
10.	Problems	1	16-06-2022		<b>TLM1</b>	
11.	Problems and Tutorial	1	17-06-2022		<b>TLM3</b>	
<b>No. of classes required to complete UNIT-V: 10</b>				<b>No. of classes taken:</b>		

#### Teaching Learning Methods

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### PART-C

#### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10

Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

### PART-D

#### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To possess knowledge in both fundamental and application aspects of mathematical, scientific, engineering principles to analyze complex engineering problems for meeting the national and international requirements and demonstrating the need for sustainable development.
PEO 2	To adapt to the modern engineering tools for planning, analysis, design, implementation of analytical data and assess their relevant significance in societal and legal issues necessary in their professional career.
PEO 3	To exhibit professionalism, ethical attitude, communication, managerial skills, team work and social responsibility in their profession and adapt to current trends by engaging in continuous learning.

#### PROGRAMME OUTCOMES (POs):

PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problem
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PO 3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
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PO 7	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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PO 12	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

#### PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Possesses necessary skill set to analyze and design various systems using analytical and software tools related to civil engineering.
PSO 2	Possesses ability to plan, examine and analyse the various laboratory tests required for the professional demands.
PSO 3	Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	B Narasimharao	B Narasimharao	B Narasimharao	Dr. V. Ramakrishna
Signature				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

## DEPARTMENT OF CIVIL ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Dr. K.V. Ramana  
Course Name & Code : Structural Analysis  
L-T-P Structure : 3-0-0 Credits : 3  
Program/Sem/Sec : B.Tech.,CE., IV-Sem., Sections- A A.Y : 2021-2022

**PRE-REQUISITE:** Applied Mechanics, Strength of materials

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** In this course, the student is exposed about analytical approach for finding the internal forces, different structural components and their structural behaviour due to applied external loads

**COURSE OUTCOMES (COs):** At the end of the course, the student will be able to:

<b>CO 1</b>	Show the reactions at the supports and joints as well as interior forces of Members subjected to different loads and Boundary Conditions.
<b>CO 2</b>	Solve for the internal forces in determinate structures viz/ namely arches, cables.
<b>CO 3</b>	Identify the appropriate method for determining the deflections of beams
<b>CO 4</b>	Solve for the internal forces in indeterminate structures viz/ namely propped cantilevers/ fixed and continuous beams
<b>CO 5</b>	Identify the appropriate method of analysis for computing internal forces, stresses in beams/ Trusses subjected to all practical load combinations

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	3	2	1	2	2		1	2	2		3	3	2
<b>CO2</b>	3	3	3	2	1	2	2		1	2	2		3	3	2
<b>CO3</b>	3	3	3	2	1	2	2		2	2	2		3	3	2
<b>CO4</b>	3	3	3	3	1	2	2		2	2	2		3	3	2
<b>CO5</b>	3	3	3	3	1	2	2		2	2	2		3	3	2

**Note:** Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-1- Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

TEXT BOOKS:

1. R.Vaidyanathan, Dr.P.Perumal, A Text Book on “Structural Analysis-Volume I& II” Laxmi Publications, Forth Edition ,2016
2. S.Ramamrutham, R.Narayan, A Text Book on “Theory of Structures” DhanpatRai Publications, Ninth Edition, 2018.

REFERENCE BOOKS:

1. Punmia. B. C., Jain, A. K., and Jain, A. K., A Text Book on “ Theory of Structures” Laxmi Publications, New Delhi, 2004
2. R.C.Hibbeler, A Text Book on “ Structural Analysis” Pearson Publications, Ninth Edit,2018.
3. T.S. Thandavamoorthy, A Text Book on “ Structural Analysis” Oxford Publications, Second Edition, 2012.
4. Bhavikatti S.S., AText book on "Analysis of Structures"-Vol. I & 2, Vikas publications, Fourth Edition, 2013.

## PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Arches and Cables

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction about SA	1	7-3-2022		TLM1	
2.	Introduction about Arches, Three hinged arches.	1	8-3-2022		TLM1	
3.	Elastic theory of arches – Eddy’s theorem	1	9-3-2022		TLM1	
4.	Determination of horizontal thrust, bending moment	1	12-3-2022		TLM1	
5.	Problems on three hinged arches	1	14-3-2022		TLM1	
6.	Normal thrust and radial shear	1	15-3-2022		TLM1	
7.	Effect of temperature.	1	16-3-2022		TLM1	
8.	Problems on three hinged arches	1	19-3-2022		TLM1	
9.	Introduction to cables, General Cable Theorem	1	21-3-2022		TLM3	
10.	Uniformly Loaded Cable	1	22-3-2022		TLM1	
11.	Anchor Cable	1	23-3-2022		TLM1	
12.	Tutorial-I	1	26-3-2022		TLM3	
No. of classes required to complete UNIT-I:12				No. of classes taken:		

UNIT-II: Deflection of Beams

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to deflection of Beams	1	28-3-2022		TLM 1	

2.	Bending into a circular arc, slope, deflection and radius of curvature	1	29-3-2022		TLM 1
3.	Differential Equation for the elastic line of a beam	1	30-3-2022		TLM 1
4.	Double integration Determination of slope and deflection for cantilever	1	2-4-2022		TLM 1
5.	Determination of slope and deflection for simply supported beams	1	4-4-2022		TLM 1
6.	Macaulay's methods- Determination of slope and deflection for cantilever	1	5-4-2022		TLM 1
7.	Determination of slope and deflection for simply supported beams	1	6-4-2022		TLM 1
8.	Mohr's theorems – Moment Area method	1	9-4-2022		TLM 1
9.	application to simple cases including overhanging beams	1	11-4-2022		TLM 1
10.	Problems on Deflection of Beams	1	12-4-2022		TLM 1
11.	Tutorial-II	1	13-4-2022		TLM 1
No. of classes required to complete UNIT-II:11				No. of classes taken:	

#### UNIT-III: Introduction to Indeterminate Structures and Energy Theorems

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Determinacy of static indeterminacies for beams, Frames, Trusses	1	16-4-2022		TLM1	
2.	Determinacy of kinematic indeterminacies for beams, Frames, Trusses	1	18-4-2022		TLM1	
3.	Problems on Indeterminate Structures	1	19-4-2022		TLM1	
4.	Introduction-Strain energy in linear elastic system	1	20-4-2022		TLM1	
5.	expression of strain energy due to axial load	1	23-4-2022		TLM1	
6.	bending moment and shear forces	1	2-5-2022		TLM1	
7.	Castigliano's first theorem- Deflections of simple beams	1	3-5-2022		TLM3	
8.	pin jointed trusses	1	4-5-2022		TLM1	
9.	application of Castigliano's second theorem	2	7-5-2022		TLM1	
10.	Problems on Castigliano's theorems	2	9-5-2022		TLM1	
11.	Tutorial-III	1	10-5-2022		TLM1	
No. of classes required to complete UNIT-III:11				No. of classes taken:		

**UNIT-IV: Fixed Beams and Propped Cantilevers**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Fixed Beams	1	11-5-2022		TLM1	
2.	statically indeterminate beams with U.D.load central point load	1	14-5-2022		TLM1	
3.	Eccentric Point Load and Number of point loads	1	16-5-2022		TLM1	
4.	uniformly varying load	1	17-5-2022		TLM1	
5.	couple and combination of loads shear force and bending moment diagrams	1	18-5-2022		TLM1	
6.	Deflection of fixed beams effect of sinking of support	1	21-5-2022		TLM1	
7.	Effect Of Rotation of A Support	1	23-5-2022		TLM3	
8.	Analysis of propped cantilevers-shear force and bending moment diagrams	1	24-5-2022		TLM1	
9.	Deflection of propped cantilevers	1	25-5-2022		TLM1	
10.	Problems on propped cantilevers	1	28-5-2022		TLM1	
11.	Tutorial-IV	1	30-5-2022		TLM3	
No. of classes required to complete UNIT-IV:11				No. of classes taken:		

**UNIT-V: Continuous Beams and Slope Deflection Method**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction-Clapeyron's theorem of three moments	1	31-5-2022		TLM1	
2.	Analysis of continuous beams with constant moment of inertia	1	1-6-2022		TLM1	
3.	continuous beams with overhang	1	4-6-2022		TLM1	
4.	continuous beams with different moment of inertia for different Spans	1	6-6-2022		TLM1	
5.	Effects of sinking of supports	1	7-6-2022		TLM1	
6.	Shear Force and Bending moment diagrams.	1	8-6-2022		TLM1	
7.	Introduction to slope deflection method, Sign Conventions	1	11-6-2022		TLM3	
8.	Fundamental Equations	1	13-6-2022		TLM1	

9.	Continuous Beams with Sinking of Supports.	1	14-6-2022		TLM1
10.	Continuous Beams without Sinking of Supports.	1	15-6-2022		TLM1
11.	Tutorial-V	1	18-6-2022		TLM3
No. of classes required to complete UNIT-V:11				No. of classes taken:	

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

## PART-C

### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

## PART-D PROGRAMME EDUCATIONAL OBJECTIVES

### (PEOs):

<b>PEO 1</b>	To possess knowledge in both fundamental and application aspects of mathematical, scientific, engineering principles to analyze complex engineering problems for meeting the national and international requirements and demonstrating the need for sustainable development.
<b>PEO 2</b>	To adapt to the modern engineering tools for planning, analysis, design, implementation of analytical data and assess their relevant significance in societal and legal issues necessary in their professional career.
<b>PEO 3</b>	To exhibit professionalism, ethical attitude, communication, managerial skills, team work and social responsibility in their profession and adapt to current trends by engaging in continuous learning.

## PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problem
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	Possesses necessary skill set to analyze and design various systems using analytical and software tools related to civil engineering.
<b>PSO 2</b>	Possesses ability to plan, examine and analyse the various laboratory tests required for the professional demands.
<b>PSO 3</b>	Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain.

Course Instructor  
Dr. K.V.Ramana

Course Coordinator  
Dr. K.V.Ramana

Module Coordinator  
B.Ramakrishna

HOD  
Dr.V.Ramakrishna





## LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC&NBA(Under Tier-I), ISO9001:2015 Certified Institution

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

http://lbrcce.ac.in, Phone: 08659-222933, Fax: 08659-222931

**FRESHMAN ENGINEERING DEPARTMENT**

### COURSE HANDOUT

#### PART-A

<b>PROGRAM</b>	: II B. Tech., II-Sem., CIVIL
<b>ACADEMIC YEAR</b>	: 2021-22
<b>COURSE NAME &amp; CODE</b>	: PROBABILITY AND STATISTICS
<b>L-T-P STRUCTURE</b>	: 3-0-0
<b>COURSE CREDITS</b>	: 3
<b>COURSE INSTRUCTOR</b>	: M. Rami Reddy
<b>COURSE COORDINATOR</b>	: M. Rami Reddy
<b>PRE-REQUISITES</b>	: None

**COURSE EDUCATIONAL OBJECTIVES (CEO):** The objective of this course is to provide students with the foundations and applications of probabilistic and statistical methods mainly used in varied applications in engineering and science.

**COURSE OUTCOMES (COs):** At the end of the course, the student will be able to

<b>CO1</b>	Understand various probabilistic situations using the laws of probability and Random variables.	<b>Understand - L2</b>
<b>CO2</b>	Apply probability distributions like Binomial, Poisson, Normal and Exponential distributions in solving engineering problems.	<b>Apply - L3</b>
<b>CO3</b>	Calculate the standard error of sampling distribution and confidence intervals for parameters like mean and proportion based on sample data.	<b>Apply - L3</b>
<b>CO4</b>	Analyze the data scientifically with the appropriate statistical methodologies to apply the suitable test of hypothesis.	<b>Analyze - L4</b>
<b>CO5</b>	Construct the regression lines to predict the dependent variables and calculate the Correlation Coefficient for a bivariate statistical data.	<b>Apply - L3</b>

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSO<sub>s</sub>):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	1	2	-	-	-	-	-	-	-	2	-	-	-
<b>CO2</b>	3	2	2	3	-	-	-	-	-	-	-	2	-	-	-
<b>CO3</b>	3	2	2	2	-	-	-	-	-	-	-	2	-	-	-
<b>CO4</b>	3	3	3	3	-	-	-	-	-	-	-	2	-	-	-
<b>CO5</b>	3	2	2	3	-	-	-	-	-	-	-	2	-	-	-

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put '-'

1- Slight (Low), 2 – Moderate (Medium), 3 - Substantial (High).

#### **BOS APPROVED TEXT BOOKS:**

T1 Jay L.Devore “Probability and Statistics for engineering and the sciences.”, 8th edition, Cengage Learning india, 2012

T2 S.C.Gupta, V.K.Kapoor, “Fundamentals of Mathematical Statistics”, 11th Edition, Sultan Chand and sons, New Delhi, 2014.

**BOS APPROVED REFERENCE BOOKS:**

R1 Miller & Freund’s “Probability and Statistics for Engineers”, 8th edition. PHI, New Delhi, 2011.

R2 B.V. Ramana, “Higher Engineering Mathematics”, 1st Edition, TMH, New Delhi, 2010.

**PART-B**

**COURSE DELIVERY PLAN (LESSON PLAN):**

**UNIT-I: Probability and Random Variables**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly	
13.	Introduction class, course outcomes	1	07-03-22		TLM1		
14.	Basic concepts of probability	1	08-03-22		TLM1		
15.	problems on basic probability	1	09-03-22		TLM1		
16.	Addition theorem, problems	1	10-03-22		TLM1		
17.	Problems on Addition theorem	1	14-03-22		TLM1		
18.	Multiplication theorem, examples	1	15-03-22		TLM1&2		
19.	Independent events, theorems	1	16-03-22		TLM1		
20.	Problems	1	17-03-22		TLM1		
21.	Baye’s theorem, Examples	1	21-03-22		TLM1&2		
22.	Problems on Baye’s theorem	1	22-03-22		TLM1		
23.	Random variables, Expectations	1	23-03-22		TLM1		
24.	Problems on PMF	1	24-03-22		TLM1		
25.	Problems on PDF	1	28-03-22		TLM1		
No. of classes required to complete UNIT-I: 13				No. of classes taken:			

**UNIT-II: Probability Distributions**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Binomial Distribution- mean & variance	1	29-03-22		TLM1&2	
2.	Problems on Binomial distribution	1	30-03-22		TLM1	
3.	Fitting of binomial distribution	1	31-03-22		TLM1	
4.	Poisson distribution, mean and variance	1	04-04-22		TLM1&2	
5.	Problems on Poisson distribution	1	06-04-22		TLM1	
6.	Fitting of Poisson distribution	1	07-04-22		TLM1	
7.	Normal distribution: mean & variance	1	11-04-22		TLM1&2	
8.	Problems on Normal Distribution	1	12-04-22		TLM1	
9.	Problems on Normal Distribution	1	13-04-22		TLM1	
10.	Exponential distribution:	1	18-04-22		TLM1	
No. of classes required to complete UNIT-II: 10				No. of classes taken:		

**UNIT-III: Sampling distribution and Estimation**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Sampling distribution ,definitions	1	19-04-22		TLM1&2	
2.	Sampling distribution of mean, variance	1	20-04-22		TLM1	
3.	Central limit theorem, Examples	1	21-04-22		TLM1&2	
4.	<b>Mid-I examinations</b>		25-04-22 to 30-04-22			
5.	Problems on central limit theorem	1	02-05-22		TLM1	
6.	Point and interval estimation	1	04-05-22		TLM1&2	
7.	Confidence Interval of mean	1	05-05-22		TLM1	
8.	Confidence Interval of proportion	1	09-05-22		TLM1	

9.	Confidence Interval of mean (n<30)	1	10-05-22		TLM1	
10.	problems	1	11-05-22		TLM1	
No. of classes required to complete UNIT-III: 09				No. of classes taken:		

#### UNIT-IV: Tests of Hypothesis

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Testing of Hypothesis , definitions	1	12-05-22		TLM1 & 2	
2.	Z-test for single mean	1	16-05-22		TLM1	
3.	Z-test for difference of means	1	17-05-22		TLM1	
4.	Z-test for single Proportion	1	18-05-22		TLM1	
5.	Z-test for difference of Proportions	1	19-05-22		TLM1	
6.	t-test for single mean	1	23-05-22		TLM1	
7.	t-test for difference of means	1	24-05-22		TLM1	
8.	Paired t-test	1	25-05-22		TLM1	
9.	F-test for variances	1	26-05-22		TLM1	
10.	$\chi^2$ -test for goodness of fit	1	30-05-22		TLM1	
11.	$\chi^2$ -test for independence of attributes	1	31-05-22		TLM1	
No. of classes required to complete UNIT-IV: 11				No. of classes taken:		

#### UNIT-V :Correlation and Regression

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Simple Bi-variate Correlation	1	01-06-22		TLM1 & 2	
2.	Problems on Pearson's Correlation	1	02-06-22		TLM1	
3.	Regression lines	1	06-06-22		TLM1	
4.	Problems on Regression lines	1	07-06-22		TLM1	
5.	Properties of Regression coefficients	1	08-06-22		TLM1 & 2	
6.	Problems on Regression coefficients	1	09-06-22		TLM1	
7.	Problems on rank Correlation	1	13-06-22		TLM1	
8.	Problems on repeated ranks	1	14-02-22		TLM1	
9.	Practice problems	1	15-06-22		TLM1	
10.	Revision	1	16-06-22		TLM1	
No. of classes required to complete UNIT-V: 10				No. of classes taken:		

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/SwayamPrabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

### PART-C

#### EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

## PART-D

### **Program Educational Objectives (PEOs):**

- PEO1** To possess knowledge in both fundamental and application aspects of mathematical, scientific, engineering principles to analyze complex engineering problems for meeting the national and international requirements and demonstrating the need for sustainable development.
- PEO2** To adapt to the modern engineering tools for planning, analysis, design, implementation of analytical data and assess their relevant significance in societal and legal issues necessary in their professional career.
- PEO3** To exhibit professionalism, ethical attitude, communication, managerial skills, team work and social responsibility in their profession and adapt to current trends by engaging in continuous learning.

### **Program Outcomes (POs):**

- PO1 - Engineering Knowledge** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 - Problem Analysis** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 - Design / Development of Solutions** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4 - Conduct Investigations of Complex Problems** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5 - Modern Tool Usage** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6 - The Engineer and Society** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7 - Environment and Sustainability** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8 - Ethics** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 - Individual and Team Work** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 - Communication** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give

and receive clear instructions.

**PO11 - Project Management and Finance** Demonstrate knowledge and understanding of the ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12 - Life-long Learning** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## **Program Specific Outcomes (PSOs):**

**PSO1** Possesses necessary skill set to analyze and design various systems using analytical and software tools related to civil engineering.

**PSO2** Possesses ability to plan, examine and analyse the various laboratory tests required for the professional demands.

**PSO3** Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain.

Course Instructor  
(M.Rami Reddy)

Course Coordinator  
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Module Coordinator  
(Dr.A.Rami Reddy)

HOD  
(Dr.A.Rami Reddy)



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF CIVIL ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Mr. M. SATYANARAYANA

**Course Name & Code** : Universal Human Values 2: Understanding Harmony (20HS01)

**L-T-P Structure** : 3-0-0

**Credits** : 3

**Program/Sem/Sec** : B.Tech IV Semester - CE

**A.Y.** : 2021-22

**PREREQUISITE:** Nil

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** To become more aware of themselves and their surroundings (family, society, nature); they would become more responsible in life and in handling problems with sustainable solutions while keeping human relationships and human nature in mind.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Apply the value inputs in life and profession
<b>CO2</b>	Distinguish between values and skills, happiness and accumulation of physical facilities, the self and the Body
<b>CO3</b>	Understand the role of a human being in ensuring harmony in society
<b>CO4</b>	Understand the role of a human being in ensuring harmony in the nature and existence
<b>CO5</b>	Distinguish between ethical and unethical practices

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>						3	2	2				1			
<b>CO2</b>						2	2					1			
<b>CO3</b>						3	2					1			
<b>CO4</b>						3	3	2				1			
<b>CO5</b>						2	2	3				2			

**TEXTBOOKS:**

- T1** R R Gaur, r singal, G P Bagaria, "Human values and Professional Ethics", Excel Books, New Delhi,2010

**REFERENCE BOOKS:**

- R1** Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999  
**R2** Human values, A N Tripathi, New Age Publishers, New Delhi, 2004  
**R3** The story of my experiments with Truth, Mohandas Karamchand Gandhi

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### UNIT-I: Need, Basic Guide lines, content and Process for value Education

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, COs	1	10-03-2022		TLM2	
2.	Process for self exploration: Natural Acceptance	1	11-03-2022		TLM.2	
3.	Experiential validation	1	12-03-2022		TLM2	
4.	Continuous Happiness and prosperity	1	17-03-2022		TLM2	
5.	A look at basic human aspirations: Right understanding	1	19-03-2022		TLM2	
6.	Relationship	1	24-03-2022		TLM2	
7.	Physical facility	1	25-03-2022		TLM2	
8.	Understanding Happiness and prosperity	1	26-03-2022		TLM2	
9.	Understanding Happiness and prosperity	1	31-03-2022		TLM2	
<b>No. of classes required to complete UNIT-I: 9</b>				<b>No. of classes taken:</b>		

#### UNIT-II: Understanding Harmony in the Human Being-Harmony in myself

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Understanding Human being as a co-existence of sentient 'I' and the material 'Body'	1	01-04-2022		TLM2	
2.	Understanding the needs of self ('I') and 'Body'- Happiness and Physical facility	1	07-04-2022		TLM2	
3.	Understanding the Body as an instrument of 'I'	1	08-04-2022		TLM2	
4.	Understanding the characteristics and activities of 'I' and harmony in 'I'	1	09-04-2022		TLM2	
5.	Understanding the harmony of I with the Body	1	16-04-2022		TLM2	
6.	Sanyam and Health	1	16-04-2022		TLM2	
7.	Correct appraisal of Physical needs	1	21-04-2022		TLM2	
8.	Meaning of prosperity in detail	1	21-04-2022		TLM1	
<b>No. of classes required to complete UNIT-II: 8</b>				<b>No. of classes taken:</b>		

**UNIT-III: Understanding Harmony in the Family and society-Harmony in Human- Human Relationship**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Understanding values in human-human relationship: meaning of justice	1	22-04-2022		TLM2	
2.	Program for fulfillment to ensure mutual happiness, Trust and Respect as the foundational values of relationship	1	23-04-2022		TLM2	
3.	Understanding Harmony in the society: Resolution	1	23-04-2022		TLM2	
4.	I-Mid examinations		25-04-2022 to 30-04-2022			
5.	Prosperity, fearlessness and co-existence as comprehensive human goals	2	05-05-2022 06-05-2022		TLM2	
6.	Visualizing a universal harmonious order in the society- undivided society	1	07-05-2022		TLM2	
7.	Universal order-from family to world family	1	12-05-2022		TLM2	
8.	Gratitude as a universal value in relationships	1	13-5-2022		TLM2	
<b>No. of classes required to complete UNIT-III: 8</b>				<b>No. of classes taken:</b>		

**UNIT-IV: Understanding Harmony in the Nature and Existence- Whole existence as Coexistence**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Understanding Harmony in the Nature	1	14-05-2022		TLM2	
2.	Interconnectedness and mutual fulfillment among four orders of nature	1	19-05-2022		TLM2	
3.	Recyclability and self regulation in nature	1	20-05-2022		TLM2	
4.	Understanding Existence as co-existence of mutually interacting units in all pervasive space	1	21-05-2022		TLM2	
5.	Understanding Existence as co-existence of mutually interacting units in all pervasive space	1	26-05-2022		TLM2	
6.	Holistic perception of harmony at all levels of existence	1	27-5-2022		TLM2	
<b>No. of classes required to complete UNIT-IV: 6</b>				<b>No. of classes taken:</b>		

**UNIT-V: Implications of the above Holistic understanding of Harmony on professional ethics**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Natural acceptance of human values	1	28-05-2022		TLM2	
2.	Definitiveness of ethical human conduct	1	02-06-2022		TLM2	



3.	Basis for humanistic education	1	03-06-2022		TLM2	
4.	Humanistic constitution and humanistic universal order	1	04-06-2022 09-06-2022		TLM2	
5.	Competence in professional ethics	1	10-06-2022		TLM2	
6.	Strategy for transition from the present state to universal human order	1	11-06-2022		TLM2	
7.	Revision	3	16-06-2022 17-06-2022 18-06-2022		TLM2	
<b>No. of classes required to complete UNIT-V: 10</b>				<b>No. of classes taken:</b>		

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### **PART-C**

#### **EVALUATION PROCESS (R17 Regulation):**

<b>Evaluation Task</b>	<b>Marks</b>
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))</b>	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
<b>Total Marks = CIE + SEE</b>	<b>100</b>

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	Possesses necessary skill set to analyze and design various systems using analytical and software tools related to civil engineering.
<b>PSO 2</b>	Possesses ability to plan, examine and analyse the various laboratory tests required for the professional demands.
<b>PSO 3</b>	Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr.M.Satyanarayana</b>	<b>Dr. B. SRINIVASA RAO</b>		<b>Dr. V.Ramakrishna</b>
<b>Signature</b>				



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**DEPARTMENT OF CIVIL ENGINEERING**

**COURSE HANDOUT**

**PART-A**

**Name of Course Instructor :** J.RANGAIAH  
 P.M.GANAGA RAJU

**Course Name & Code :** H & H M LAB & 20CE57      **Regulation:** R20

**L-T-P Structure :** 0-0-3      **Credits:** 1.5

**Program/Sem/Sec :** II B.Tech., II sem      **A.Y.:** 2021-22

**PREREQUISITE :** Mechanics of Fluids, Hydraulics and Hydraulic Machinery Systems

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** The student is given hands on training in working on fluid flow hydraulic machinery equipment and performs experiments to verify the principles of fluid mechanics and hydraulics based on laws of conservation of mass, energy, and momentum.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Develop knowledge on the fundamental principles of fluid flow. (Apply-L3)
<b>CO2</b>	Apply the laws of conservation of mass, energy, and momentum to solve practical problems in fluid mechanics. (Apply-L3)
<b>CO3</b>	Practically visualize the functioning and performance of hydraulic turbines and pumps. (Understand-L2)

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	3	-	-	-	-	-	2	-	-	1	2	-
CO2	2	-	-	3	-	-	-	-	-	2	-	-	1	2	-
CO3	2	-	-	3	-	-	-	-	-	2	-	-	1	2	-
1 - Low			2 -Medium						3 - High						

**TEXTBOOKS/REFERENCE BOOKS:**

Laboratory manual developed by Civil Engineering Department

# HYDRAULICS AND HYDRAULIC MACHINERY LAB (20CE57)

COURSE: IV SEMESTER

A.Y: 2021-22

## PART-B

### LIST OF EXPERIMENTS

#### I CYCLE

1. Determination of coefficient of discharge of Mouth-piece apparatus
2. Determination of coefficient of discharge of given Notches
3. Calibration of given Venturimeter.
4. Experiment on Orifice meter set-up
5. Verification of Bernoulli's theorem

#### II CYCLE

1. Experiment on Friction in pipes.
2. Impact of jet on vanes.
3. Calibration of Turbine Flow Meter.
4. Performance characteristics of Pelton Wheel Turbine.
5. Operating characteristics of Centrifugal Pump.

### LIST OF BATCHES

<b>BATCH:A (Thursday)</b>	<b>BATCH:B (Friday)</b>
A <sub>1</sub> -----20761A0101 to 20761A0106	B <sub>1</sub> ----20761A0136 to 20761A0141
A <sub>2</sub> -----20761A0108 to 20761A0114	B <sub>2</sub> ---- 20761A0142 to 20761A0148
A <sub>3</sub> -----20761A0115 to 20761A0120	B <sub>3</sub> ---- 20761A0149 to 20761A0154
A <sub>4</sub> ----- 20761A0122 to 20761A0128	B <sub>4</sub> ---- 20761A0155 to 20761A0158 B <sub>4</sub> ---- 21765A0101 to 21765A0103
A <sub>5</sub> ----- 20761A0129 to 20761A0135	B <sub>4</sub> ---- 21765A0104 to 21765A0110

**Lab-In charge**

**HYDRAULICS AND HYDRAULIC MACHINERY LAB (20CE57)****COURSE: IV SEMESTER****A.Y: 2021-22****I CYCLE SCHEDULE: BATCH-A (THURSDAY)**

<b>Tentative Date of Completion</b>	<b>Actual Date of Completion</b>	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>
10/03/2022		Demo	Demo	Demo	Demo	Demo
17/03/2022		A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>
24/03/2022		A <sub>6</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>
31/03/2022		A <sub>5</sub>	A <sub>6</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>
07/04/2022		A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	A <sub>1</sub>	A <sub>2</sub>
21/04/2022		A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	A <sub>1</sub>
05/05/2022		A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>

**I CYCLE SCHEDULE: BATCH-B (FRIDAY)**

<b>Tentative Date of Completion</b>	<b>Actual Date of Completion</b>	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>
11/03/2022		Demo	Demo	Demo	Demo	Demo
25/03/2022		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>	B <sub>5</sub>
01/04/2022		B <sub>6</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
08/04/2022		B <sub>5</sub>	B <sub>6</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>
22/04/2022		B <sub>4</sub>	B <sub>5</sub>	B <sub>6</sub>	B <sub>1</sub>	B <sub>2</sub>
29/04/2022		B <sub>3</sub>	B <sub>4</sub>	B <sub>5</sub>	B <sub>6</sub>	B <sub>1</sub>
06/05/2022		B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>	B <sub>5</sub>	B <sub>6</sub>

**Lab-In charge**

**HYDRAULICS AND HYDRAULIC MACHINERY LAB (20CE57)**

**COURSE: IV SEMESTER**

**A.Y: 2021-22**

**II CYCLE SCHEDULE: BATCH-A (THURSDAY)**

Tentative Date of Completion	Actual Date of Completion	I	II	III	IV	V
12/05/2022		A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>
19/05/2022		A <sub>6</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>
26/05/2022		A <sub>5</sub>	A <sub>6</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>
02/06/2022		A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	A <sub>1</sub>	A <sub>2</sub>
09/06/2022		A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	A <sub>1</sub>
16/06/2022		A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>

**II CYCLE SCHEDULE: BATCH-B (FRIDAY)**

Tentative Date of Completion	Actual Date of Completion	I	II	III	IV	V
13/05/2022		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>	B <sub>5</sub>
20/05/2022		B <sub>6</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
27/05/2022		B <sub>5</sub>	B <sub>6</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>
03/06/2022		B <sub>4</sub>	B <sub>5</sub>	B <sub>6</sub>	B <sub>1</sub>	B <sub>2</sub>
10/06/2022		B <sub>3</sub>	B <sub>4</sub>	B <sub>5</sub>	B <sub>6</sub>	B <sub>1</sub>
17/06/2022		B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>	B <sub>5</sub>	B <sub>6</sub>

**Lab-In charge**

## HYDRAULICS AND HYDRAULIC MACHINERY LAB (20CE57)

COURSE: IV SEMESTER

A.Y: 2021-22

### LAB TIME TABLE

Day	FN	AN
Monday		
Tuesday		
Wednesday		
Thursday		IV Semester Batch- A
Friday	IV Semester Batch- B	
Saturday		

**Batch – A:** 20761A0101 to 20761A0135

**Batch – B:** 20761A0136 to 20761A0158 & 21765A0101 to 21765A0110

### ACADEMIC CALENDAR

Description	From	To	Weeks
I Phase of Instructions	07-03-2022	23-04-2022	7 W
I Mid Examinations	25-04-2022	30-04-2022	1 W
II Phase of Instructions	02-05-2022	18-06-2022	7 W
II Mid Examinations	20-06-2022	25-06-2022	1 W
Preparation and Practicals	27-06-2022	02-07-2022	1 W
Semester End Examinations	04-07-2022	16-07-2022	2 W

**Lab-In charge**

## PART-C

### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Ex. no's	Marks
Day to Day work = A	1,2,3,4,5,6,7,8,9,10	A=05
Record = B	1,2,3,4,5,6,7,8,9,10	B=05
Internal Test = C	1,2,3,4,5,6,7,8,9,10	C = 05
<b>Cumulative Internal Examination: A + B + C = 15</b>	1,2,3,4,5,6,7,8,9,10	15
<b>Semester End Examinations = D</b>	1,2,3,4,5,6,7,8,9,10	D = 35
<b>Total Marks: A + B + C + D = 50</b>	1,2,3,4,5,6,7,8,9,10	50

## PART-D

### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

<b>PEO 1</b>	To possess knowledge in both fundamental and application aspects of mathematical, scientific, engineering principles to analyze complex engineering problems for meeting the national and international requirements and demonstrating the need for sustainable development.
<b>PEO 2</b>	To adapt to the modern engineering tools for planning, analysis, design, implementation of analytical data and assess their relevant significance in societal and legal issues necessary in their professional career.
<b>PEO 3</b>	To exhibit professionalism, ethical attitude, communication, managerial skills, team work and social responsibility in their profession and adapt to current trends by engaging in continuous learning.

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problem
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.



<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	Possesses necessary skill set to analyze and design various systems using analytical and software tools related to civil engineering.
<b>PSO 2</b>	Possesses ability to plan, examine and analyse the various laboratory tests required for the professional demands.
<b>PSO 3</b>	Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
Name of the Faculty	J.Rangaiah	J.Rangaiah	J.Rangaiah	Dr. V.Ramakrishna
Signature				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF CIVIL ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** B. NARASIMHARAO

M. SATYANARAYANA

**Course Name & Code** : GEOTECHNICAL ENGINEERING LAB & 20CE58 **Regulation:**R20

**L-T-P Structure** : 0-0-3 **Credits:** 1.5

**Program/Sem/Sec** : II B.Tech., II sem **A.Y.:** 2021-22

**PREREQUISITE** : GEOTECHNICAL ENGINEERING

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** The course aims to train the students in performing laboratory experiments to find the basic properties soil. The course coverage includes the various field applications of soil.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Identify the tools, equipment required, and experimental procedure used in soil investigation ( <b>Understand-L2</b> )
<b>CO2</b>	Determine the index and engineering properties of soil ( <b>Apply-L3</b> )
<b>CO3</b>	Perform field and laboratory tests for soil investigations to compute desired parameters ( <b>Apply-L3</b> )
<b>CO4</b>	Apply field conditions for computing and analyzing the experimental data ( <b>Understand-L2</b> )

**COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	-	-	-	3	-	-	-	-	2	-	1	-	3	1
<b>CO2</b>	2	-	-	-	3	-	-	-	-	2	-	1	-	3	1
<b>CO3</b>	2	-	-	-	3	-	-	-	-	2	-	1	-	3	1
<b>CO4</b>	2	3	-	-	-	-	-	-	-	2	-	1	3	-	1
	1 - Low				2 -Medium				3 - High						

#### **TEXTBOOKS/REFERENCE BOOKS:**

Laboratory manual developed by Civil Engineering Department

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN):**

#### **CYCLE-I**

1. Determination of specific gravity by Pycnometer method. (EXP-I)
2. Determination of free swell index. (EXP-II)
3. Determination of field unit weight of soil by Core cutter method. (EXP-III)
4. Determination of field unit weight of soil by Sand replacement method. (EXP-IV)
5. Particle size distribution curve by Mechanical Sieve Analysis. (EXP-V)

#### **CYCLE-II**

6. Determination of Atterberg limits. (EXP-VI)
7. Determination of coefficient of permeability of Coarse-grained soil by Constant head permeameter. (EXP-VII)
8. Determination of MDD and OMC of given soil by Standard proctor test. (EXP-VIII)
9. Determination of shear strength parameters of given soil by Direct shear test. (EXP-IX)
10. Determination of undrained shear strength of soil by Unconfined compression test. (EXP-X)

#### **CYCLE-I**

DATE	A-1	A-2	A-3	A-4	A-5	A-6
12-03-2022	DEMO	DEMO	DEMO	DEMO	DEMO	DEMO
19-03-2022	EXP-I	EXP-II	EXP-III	EXP-IV	EXP-V	EXP-I
26-03-2022	EXP-II	EXP-III	EXP-IV	EXP-V	EXP-I	EXP-II
09-04-2022	EXP-III	EXP-IV	EXP-V	EXP-I	EXP-II	EXP-III
16-04-2022	EXP-IV	EXP-V	EXP-I	EXP-II	EXP-III	EXP-IV
23-04-2022	EXP-V	EXP-I	EXP-II	EXP-III	EXP-IV	EXP-V
DATE	B-1	B-2	B-3	B-4	B-5	B-6
10-03-2022	DEMO	DEMO	DEMO	DEMO	DEMO	DEMO
17-03-2022	EXP-I	EXP-II	EXP-III	EXP-IV	EXP-V	EXP-I
24-03-2022	EXP-II	EXP-III	EXP-IV	EXP-V	EXP-I	EXP-II
31-03-2022	EXP-III	EXP-IV	EXP-V	EXP-I	EXP-II	EXP-III
07-04-2022	EXP-IV	EXP-V	EXP-I	EXP-II	EXP-III	EXP-IV
21-04-2022	EXP-V	EXP-I	EXP-II	EXP-III	EXP-IV	EXP-V

## **CYCLE-II**

DATE	A-1	A-2	A-3	A-4	A-5	A-6
07-05-2022	EXP-VI	EXP-VII	EXP-VIII	EXP-IX	EXP-X	EXP-VI
21-05-2022	EXP-VII	EXP-VIII	EXP-IX	EXP-X	EXP-VI	EXP-VII
28-05-2022	EXP-VIII	EXP-IX	EXP-X	EXP-VI	EXP-VII	EXP-VIII
04-06-2022	EXP-IX	EXP-X	EXP-VI	EXP-VII	EXP-VIII	EXP-IX
11-06-2022	EXP-X	EXP-VI	EXP-VII	EXP-VIII	EXP-IX	EXP-X
18-06-2022	INTERNAL	INTERNAL	INTERNAL	INTERNAL	INTERNAL	INTERNAL
DATE	B-1	B-2	B-3	B-4	B-5	B-6
05-05-2022	EXP-VI	EXP-VII	EXP-VIII	EXP-IX	EXP-X	EXP-VI
19-05-2022	EXP-VII	EXP-VIII	EXP-IX	EXP-X	EXP-VI	EXP-VII
26-05-2022	EXP-VIII	EXP-IX	EXP-X	EXP-VI	EXP-VII	EXP-VIII
02-06-2022	EXP-IX	EXP-X	EXP-VI	EXP-VII	EXP-VIII	EXP-IX
09-06-2022	EXP-X	EXP-VI	EXP-VII	EXP-VIII	EXP-IX	EXP-X
16-06-2022	INTERNAL	INTERNAL	INTERNAL	INTERNAL	INTERNAL	INTERNAL

## **BATCHES**

<b><u>BATCH-A</u></b>	<b><u>BATCH-B</u></b>
A1-20761A0101,102,103,104,105	B1-20761A0136,137,138,139,140
A2-20761A0106,108,109,111,112	B2-20761A0141,142,143,145,146
A3-20761A0113,114,115,116,117	B3-20761A0147,148,149,150,151
A4-20761A0118,119,120,122,123	B4-20761A0152,153,154,155,156
A5- 20761A0124,125,126,127,128,129	B5-20761A0157,158,21765A0101,102,103,104
A6-20761A0130,131,132,133,134,135	B6- 21765A0105,106,107,108,109,110

## **PART-C**

### **EVALUATION PROCESS (R20 Regulation):**

<b>Evaluation Task</b>	<b>Expt. no's</b>	<b>Marks</b>
Day to Day work = A	1,2,3,4,5,6,7,8...	A=05
Record = B	1,2,3,4,5,6,7,8	B=05
Internal Test = C	1,2,3,4,5,6,7,8	C = 05
<b>Cumulative Internal Examination: A + B + C = 15</b>	1,2,3,4,5,6,7,8	<b>15</b>
<b>Semester End Examinations = D</b>	1,2,3,4,5,6,7,8	<b>D = 35</b>
<b>Total Marks: A + B + C + D = 50</b>	1,2,3,4,5,6,7,8	<b>50</b>

## PART-D

### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

<b>PEO 1</b>	To possess knowledge in both fundamental and application aspects of mathematical, scientific, engineering principles to analyze complex engineering problems for meeting the national and international requirements and demonstrating the need for sustainable development.
<b>PEO 2</b>	To adapt to the modern engineering tools for planning, analysis, design, implementation of analytical data and assess their relevant significance in societal and legal issues necessary in their professional career.
<b>PEO 3</b>	To exhibit professionalism, ethical attitude, communication, managerial skills, team work and social responsibility in their profession and adapt to current trends by engaging in continuous learning.

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problem
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	Possesses necessary skill set to analyze and design various systems using analytical and software tools related to civil engineering.
<b>PSO 2</b>	Possesses ability to plan, examine and analyse the various laboratory tests required for the professional demands.
<b>PSO 3</b>	Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>B Narasimharao</b>	<b>B Narasimharao</b>	<b>B Narasimharao</b>	<b>Dr. V. Ramakrishna</b>
<b>Signature</b>				



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## ADVANCED SURVEYING LAB (20CE59)

### LIST OF EXPERIMENTS

**COURSE: IV SEMESTER**

**A.Y: 2021-22**

#### I CYCLE

1. (a) Study of Transit Theodolite  
(b) Measurement of Horizontal Angle by Repetition Method  
(c) Measurement of Horizontal Angle by Reiteration Method
2. Closed Traversing using Theodolite Survey
3. (a) Measurement of Vertical Angles  
(b) Heights and Distances - Single Plane Method
4. (a) Tacheometer Constants  
(b) Tacheometry - Stadia System

#### II CYCLE

1. (a) Study of Total Station  
(b) Measurement of Horizontal Angle, Horizontal Distance, Vertical Distance and Vertical Angle  
[Total Station]
2. Area and Perimeter by Total Station
3. (a) Stake out of The Given Points by Total Station  
(b) Remote Distance Measurement (RDM) by Total Station
4. (a) Distance Between Two Given Points by Total Station  
(b) Determine the Point Coordinates by Total Station
5. Setting out The Foundation Plan of The Building
6. Contouring by Block Levelling
7. Simple Circular Curve by Linear Method
8. Simple Circular Curve by Rankine Method



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**ADVANCED SURVEYING LAB (20CE59)**

**COURSE : IV SEMESTER**

**A.Y: 2021-22**

**I Cycle Schedule: BATCH-A (Monday)**

Sl.No	Name of the Experiment	Tentative Date	Actual Date
1	(a) Study of Transit Theodolite	19/3/2022	19/3/2022
	(b) Measurement of Horizontal Angle by Repetition Method	20/3/2022	20/3/2022
	(c) Measurement of Horizontal Angle by Reiteration Method		
2	Closed Traversing using Theodolite Survey	25/3/2022	25/3/2022
3	(a) Measurement of Vertical Angles (b) Heights and Distances - Single Plane Method	26/3/2022	26/3/2022
4	(a) Tacheometer Constants (b) Tacheometry - Stadia System		

**I Cycle Schedule: BATCH-B (Saturday)**

Sl.No	Name of the Experiment	Tentative Date	Actual Date
1	(a) Study of Transit Theodolite	1/4/2022	1/4/2022
	(b) Measurement of Horizontal Angle by Repetition Method	2/4/2022	2/4/2022
	(c) Measurement of Horizontal Angle by Reiteration Method		
2	Closed Traversing using Theodolite Survey	8/4/2022	8/4/2022
3	(a) Measurement of Vertical Angles (b) Heights and Distances - Single Plane Method	9/4/2022	9/4/2022
4	(a) Tacheometer Constants (b) Tacheometry - Stadia System	15/4/2022	15/4/2022



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**ADVANCED SURVEYING LAB (20CE59)**

**COURSE:IV SEMESTER**

**A.Y: 2021-22**

**II Cycle Schedule: BATCH-A (Monday)**

Sl.No	Name of the Experiment	A <sub>1</sub> , A <sub>2</sub> , A <sub>3</sub>	A <sub>1</sub> , A <sub>2</sub> , A <sub>3</sub>
		Tentative Date	Actual Date
1	(a) Study of Total Station (b) Measurement of Horizontal Angle, Horizontal Distance, Vertical Distance and Vertical Angle [Total Station]	16/4/2022	16/4/2022
2	Area and Perimeter by Total Station	22/4/2022	22/4/2022
3	(a) Stake out of The Given Points by Total Station (b) Remote Distance Measurement (RDM) by Total Station	23/4/2022	23/4/2022
4	(a) Distance Between Two Given Points by Total Station (b) Determine the Point Coordinates by Total Station	29/4/2022	29/4/2022
5	Setting out The Foundation Plan of The Building	30/4/2022	30/4/2022
6	Simple Circular Curve by Linear Method	7/5/2022	7/5/2022
7	Simple Circular Curve by Rankine Method	13/5/2022	13/5/2022
8	Internal Test	14/5/2022	14/5/2022





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**ADVANCED SURVEYING LAB (20CE59)**

**COURSE:IV SEMESTER**

**A.Y: 2021-22**

**II Cycle Schedule: BATCH-B (Saturday)**

Sl.No	Name of the Experiment	B <sub>1</sub> , B <sub>2</sub> , B <sub>3</sub>	B <sub>1</sub> , B <sub>2</sub> , B <sub>3</sub>
		Tentative Date	Actual Date
1	(a) Study of Total Station (b) Measurement of Horizontal Angle, Horizontal Distance, Vertical Distance and Vertical Angle [Total Station]	2/6/2022	2/6/2022
2	Area and Perimeter by Total Station	3/6/2022	3/6/2022
3	(a) Stake out of The Given Points by Total Station (b) Remote Distance Measurement (RDM) by Total Station	4/6/2022	4/6/2022
4	(a) Distance Between Two Given Points by Total Station (b) Determine the Point Coordinates by Total Station	10/6/2022	
5	Setting out The Foundation Plan of The Building	11/6/2022	
6	Simple Circular Curve by Linear Method	17/5/2020	
7	Simple Circular Curve by Rankine Method	18/5/2022	
8	Internal Test	19/5/2022	

**Lab-In charge**