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 RAMA KRISHNA
Course Name & Code **:** design and drawing of reinforced concrete structures & 23CE08
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech., V-Sem., Civil **A.Y.:** 2026-27

PREREQUISITE: Building Materials

Course Objectives Upon successful completion of this course, the student will be able to

1. 1. Familiarize Students with different types of design philosophies.
2. Equip student with concepts of design of flexural members.
3. Understand Concepts of shear, bond and torsion.
4. Familiarize students with different types of compressions members and Design.
5. Understand different types of footings and their design.

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

CO1:	Understand the fundamental procedures and guidelines given in relevant IS Codes for design of various RCC elements such as beams, columns, foundations, slabs, shear reinforcement, under Working stress and Limit State methods **(Understand-L2)**
CO2:	Design and detailing of various flexural members **(Apply-L3)**
CO3:	Limit state design of structures subjected to shear, bond and torsion **(Apply-L3)**
CO4:	Design of compression members subjected to axial load, uni-axial and bi-axial moments, Design of different types of shallow foundations **(Apply-L3)**
CO5:	Design the one way and two-way slabs with different end conditions using appropriate design guidelines **(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
CO1	1	-	-	-	2	-	2	-	-	-	-	-	2	-	2
CO2	-	-	-	-	2	-	2	-	-	-	-	-	-	2	3
CO3	1	-	-	-	2	-	1	-	-	-	-	-	-	2	3
CO4	1	-	-	1	-	-	2	-	-	-	-	-	-	-	2
CO5	1			1			1								2
1 - Low					**2** –Medium						**3** - High				

Textbooks:

1. 'Limit State Design' by A. K. Jain
2. 'Reinforced Concrete Structures' by S. Unnikrishna Pillai &Devdas Menon, Tata Mc.Graw Hill, New Delhi.

Reference Books:

1. Design of concrete structures' by N. Krishna Raju.
2. 'Reinforced Concrete Structures' by Park and Pauley, John Wiley and Sons.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Working stress and limit state methods

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 Syllabus and Cos	1	29-06-2026		**TLM1**	
2.	Working stress method Design codes and handbooks	1	30-06-2026		**TLM1**	
3.	loading standards basic IS Definitions	1	03-07-2026		**TLM1**	
4.	Types of sections in WS Method	1	06-07-2026		**TLM1**	
5.	working stress method of design of singly	1	07-07-2026		**TLM1**	
6.	working stress method of design of doubly reinforced beams.	1	10-07-2026		**TLM1**	
7.	Concepts of limit state design	1	13-07-2026		**TLM1**	
8.	representative stress-strain curves for steel bars	1	14-07-2026		**TLM1**	
9.	Assumptions in limit state design	1	17-07-2026		**TLM1**	
10.	stress - block parameters	1	20-07-2026		**TLM1**	
11.	limiting moment of Resistance.	1	21-07-2026		**TLM1**	
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

NIT-II: Design for flexure

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.	Limit state analysis and design of singly reinforced sections	1	24-07-2026		**TLM1**	
2.	Moment of Resistance	1	27-07-2026		**TLM1**	
3.	design of doubly reinforced sections	1	28-07-2026		**TLM1**	
4.	flanged (T) beam sections	1	31-07-2026		**TLM1**	
5.	Minimum requirements for design of flanged sections	1	03-08-2026		**TLM1**	
6.	Minimum Tension Reinforcement-Maximum Flexural Steel	1	04-08-2026		**TLM1**	
7.	Effective width of flange	1	07-08-2026		**TLM1**	
8.	Design of Flanged Sections	1	10-08-2026		**TLM1**	
No. of classes required to complete UNIT-II:8				**No. of classes taken:**		

UNIT-III: Design for Shear, Torsion and Bond

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.	Limit state analysis and design of section for shear	1	11-08-2026		TLM1	
2.	Design of shear reinforcement	1	14-08-2026		TLM1	
3.	Design for torsion	1	17-08-2026		TLM1	
4.	concept of bond, anchorage and development length	1	18-08-2026		TLM1	
5.	I.S. code provisions	1	21-08-2026		TLM1	
6.	Design of continuous beams	1	31-08-2026		TLM1	
7.	Limit state design for serviceability:.	1	01-09-2026		TLM1	
8.	Deflection, cracking and code provision	1	07-09-2026		TLM1	
No. of classes required to complete UNIT-III: 8				**No. of classes taken:**		

UNIT-IV: Design of Compression members

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.	Effective length of a column and IS code provisions	1	08-09-2026		TLM1	
2.	Design of short columns -axial load	1	11-09-2026		TLM1	
3.	Design of short columns -uni axial load	1	15-09-2026		TLM1	
4.	Design of short columns -bi-axial load	1	18-09-2026		TLM1	
5.	Design of long columns	1	21-09-2026		TLM1	
6.	Braced and un-braced columns	1	22-09-2026		TLM1	
7.	Different types of footings	1	25-09-2026		TLM1	
8.	Design of isolated footings Square footings	1	28-09-2026		TLM1	
9.	Rectangular footings	1	29-09-2026		TLM1	
10.	circular footing	1	05-10-2026		TLM1	
11.	spread & sloped footings	1	06-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Slabs

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.	Classification of slabs and IS code provisions	1	09-10-2026		**TLM1**	
2.	design of one - way slabs	1	12-10-2026		**TLM1**	
3.	design of slabs, two - way slabs	1	13-10-2026		**TLM1**	
4.	Design of continuous slabs	1	16-10-2026		**TLM1**	
5.	Practice problems	1	26-10-2026		**TLM1**	
6.	Practice problems	1	27-10-2026		**TLM1**	
7.	design of waist-slab staircase.	1	30-10-2026		**TLM1**	
No. of classes required to complete UNIT-V: 7				**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 (R23 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 OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	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.
PO 3	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.
PO 4	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.
PO 5	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
PO 6	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.
PO 7	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.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	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.
PO 11	Project management and finance: 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.
PO 12	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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Possesses necessary skill set to analyse 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 Rama Krishna**	**B. Ramakrishna**	**Dr C Raamallu**	**Dr. K V Ramana**
Signature				

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Accredited by NAAC with "A" Grade and NBA (CSE, IT, ECE, EEE & ME) under Tier - I
College Code: 76

DEPARTMENT OF CIVIL ENGINEERING
COURSE HANDOUT

PART-A

Name of Course Instructor	: J.Rangaiah	
Course Name & Code	: Engineering Hydrology (23CE09)	
L-T-P Structure	: 3-0-0	Credits : 3
Program/Sem/Sec	: CIVIL., V-Sem.	A.Y : 2026-27

Prerequisite: Fluid Mechanics, H&HM

Course Educational Objectives:

The course allows the student to get the fundamentals of hydrology and its importance in development of water resources. The student to learn physical processes and their interactions in hydrology, measurement and estimation of the components of hydrologic cycle. Hydrographs, flood frequency analysis, design flood and flood routing methods. Study the concepts of groundwater movement and well hydraulics.

Course Outcomes (COs): At the end of the course, students will be able to

CO1: Understand the basic concepts of hydrology and factors affecting the hydrological components. (Understand-L2)
CO2: Compute the average rainfall over an area and estimate the runoff for a given data (Apply-L3)
CO3: Understand concepts of Hydrographs. flood frequency analysis, groundwater movement and well hydraulics. (Understand-L2)
CO4: Develop unit hydrograph and synthetic hydrograph, and estimate flood magnitude and carry out flood routing. (Apply-L3)
CO5: Determine aquifer parameters and yield of wells. (Apply-L3)

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	1
CO2	3	-	-	2	-	-	-	-	-	-	-	-	3	-	1
CO3	3	-	-	2	-	-	-	-	-	-	-	-	3	-	1
CO4	3	-	-	-	-	-	-	-	-	-	-	-	3	-	1
CO5	3	-	-	2	-	-	-	-	-	-	-	-	3	-	1

1=Slight(low) 2=Moderate (Medium) 3=Substantial (High)

Textbooks: -

1. 'Engineering Hydrology' by Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
2. 'Engineering Hydrology' by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi

References:

1. 'Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
2. 'Hydrology' by Raghunath. H.M., New Age International Publishers, (2010)
3. 'Engineering Hydrology – Principles and Practice' by Ponce V.M., Prentice Hall International, (1994)
4. 'Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications, (2011).

PART-B
COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

S.No.	Topics to be covered	No. of Classes Requi red	Tentative Date of Completion	Actual Date of Complete on	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Engineering hydrology and its applications	1	29-06-26		TLM1	CO1	T1	
2.	Hydrologic cycle, hydrological data-sources of data.	1	01-07-26		TLM1	CO1	T1	
3.	Types and forms of Precipitation:	1	03-07-26		TLM2	CO1	T1	
4.	Measurement of Precipitation	1	06-07-26		TLM2	CO1	T1	
5.	Rain gauge network, presentation of rainfall data	1	08-07-26		TLM1	CO1	T1	
6.	Problems	1	10-07-26		TLM1	CO2	T1	
7.	Average rainfall	1	13-07-26		TLM1	CO1	T1	
8.	Problems	1	15-07-26		TLM1	CO2	T1	
9	Continuity and consistency of rainfall data, Frequency of rainfall	1	16-07-26		TLM1	CO2	T1	
10.	Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves,	1	17-07-26		TLM1	CO2	T1	
11	Probable Maximum Precipitation (PMP), design storm.	1	20-07-26		TLM1	CO1	T1	
No. of classes required to complete UNIT-I				No. of classes taken:				

UNIT-II:

S.No.	Topics to be covered	No. of Classes Requi red	Tentative Date of Completion	Actual Date of Complete on	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Initial abstractions,	1	22-07-26		TLM2	CO1	T1	

	Evaporation: factors affecting							
2.	Measurement, reduction	1	24-07-26		TLM2	CO1	T1	
3.	Factors affecting Evapotranspiration:	1	27-07-26		TLM2	CO1	T1	
4.	Measuremen control Evapotranspiration	1	29-07-26		TLM1	CO1	T1	
5.	Estimation of evapotranspiration	1	31-07-26		TLM1	CO1	T1	
6.	Problems	1	03-08-26		TLM1	CO2	T1	
7.	Infiltration: factors affecting	1	05-08-26		TLM2	CO1	T1	
8.	Infiltration capacity curve, measurement	1	07-08-26		TLM2	CO1	T1	
9.	Infiltration indices.	1	10-08-26		TLM1	CO1	T1	
10	Problems	1	12-08-26		TLM1	CO2	T1	
No. of classes required to complete UNIT-II				No. of classes taken:				

UNIT-III

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completeon	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Factors affecting runoff, components,	1	14-08-26		TLM2	CO3	T1	
2.	Empirical formulae, tables and curves,	1	17-08-26		TLM2	CO3	T1	
3.	Stream gauging, rating curve, Flow mass curve and flow duration curve.	1	19-08-26		TLM2	CO3	T1	
4.	Components of hydrograph, separation of base flow,	1	21-08-26		TLM2	CO3	T1	
5.	Effective rainfall hyetograph and direct runoff hydrograph, Unit hydrograph, assumptions, derivation of unit hydrograph,	1	31-08-26		TLM2	CO3	T1	
6.	Problems	1	02-09-26		TLM1	CO3	T1	
7.	Unit hydrographs of different durations, principle of superposition. S-hydrograph methods,	1	07-09-26		TLM1	CO4	T1	
8.	Problems	1	09-09-26		TLM1	CO4	T1	
9.	Limitations and applications of unit hydrograph, Dimensionless unit hydrograph, synthetic unit hydrograph, introduction to IUH.	1	11-09-26		TLM1	CO3	T1	
No. of classes required to complete UNIT-III				No. of classes taken:				

UNIT-IV

S.No.	Topics to be covered	No. of Classes Requi red	Tentative Date of Completion	Actual Date of Complete on	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Floods: Causes and effects, Gumbel's methods,	1	16-09-26		TLM2	CO3	T1	
2.	Log-Pearson type III distribution methods,	1	18-09-26		TLM1	CO3	T1	
3.	Problems	1	21-09-26		TLM1	CO3	T1	
4.	Standard Project Flood (SPF) and Probable Maximum Flood (MPF)	1	23-09-26		TLM1	CO4	T1	
5.	Flood control methods and management.	1	25-09-26		TLM1	CO4	T1	
6.	Hydrologic routing, channel and reservoir routing	1	28-09-26		TLM2	CO3	T1	
7.	Muskingum method of routing. Puls method of routing	1	30-09-26		TLM2	CO3	T1	
8.	. Problems	1	05-10-26		TLM1	CO3	T1	
No. of classes required to complete UNIT-IV				No. of classes taken:				

UNIT-V

S.No.	Topics to be covered	No. of Classes Requi red	Tentative Date of Completion	Actual Date of Complete on	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Occurrence, types of aquifers	1	07-10-26		TLM2	CO3	T1	
2.	Aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient,	1	09-10-26		TLM2	CO3	T1	
3.	Types of wells, Darcy's law, Dupuit's equation-	1	12-10-26		TLM1	CO3	T1	
4.	Steady radial flow to wells in confined	1	14-10-26		TLM1	CO3	T1	
5.	Steady radial flow to wells in unconfined aquifers	1	16-10-26		TLM1	CO3	T1	
6	Problems	1	26-10-26		TLM1	CO5	T1	
7.	Yield of an open well-recuperation test.	1	28-10-26		TLM1	CO5	T1	
8.	Problems	1	30-10-26		TLM1	CO3	T1	
No. of classes required to complete UNIT-V				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:

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

ACADEMIC CALENDAR

Description	From	To	Weeks
I Phase of Instructions	29-06-2026	22-08-2026	8 W
I Mid Examinations	24-08-2026	29-08-2026	1 W
II Phase of Instructions	31-08-2026	31-10-2026	8 W
II Mid Examinations	02-11-2026	07-11-2026	1 W
Preparation and Practical's	09-11-2026	14-11-2026	1 W
Semester End Examinations	16-11-2026	28-11-2026	2 W

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**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.
PO 3	**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.
PO 4	**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.
PO 5	**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.
PO 6	**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.
PO 7	**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.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**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.
PO 11	**Project management and finance**: 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.
PO 12	**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.

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 analyze 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

Course Instructor	Course Coordinator	Module Coordinator	HOD

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ISO 21001:2018 Certified & Accredited by NBA (under tier-1) & NAAC
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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT
PART-A

Name of Course Instructor : B NARASIMHARAO
Course Name & Code : GEOTECHNICAL ENGINEERING-I & 23CE10
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., CE/V-Sem., A.Y : 2026-27

Pre-requisites: NIL

Course Educational Objective: The course aims to teach the different properties and classifications of soil. The course coverage includes the various procedures for determining index and engineering properties of soils.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Understand the soil formation, its index properties and classification. **(Understand-L2)**

CO2: Understand the soil moisture and flow of water through soils and its effects. **(Understand-L2)**

CO3: Evaluate the stress distribution of soil subjected to different loading conditions. **(Apply-L3)**

CO4: Understand Compaction and Compressibility characteristics under partially saturated and fully saturated conditions. **(Understand-L2)**

CO5: Evaluate the shear strength of soil at different loading & drainage conditions for different soils. **(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
CO1	2	3	-	-	-	-	-	-	-	-	-	1	2	-	1
CO2	2	2	-	-	-	-	-	-	-	-	-	1	2	-	1
CO3	3	3	-	-	-	-	-	-	-	-	-	1	2	-	1
CO4	3	3	-	-	-	-	-	-	-	-	-	1	2	-	1
CO5	3	3	-	-	-	-	-	-	-	-	-	1	2	-	1
1 - Low			**2 –**Medium							**3 -** High					

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

TEXTBOOKS:

1. 'Soil Mechanics and Foundation Engineering by Dr. K.R. Arora, Standard Publishers and Distributors, New Delhi.
2. Basic and Applied Soil Mechanics' by Gopal Ranjan and A.S.R.Rao, New Age International Publishers.
3. 'Soil Mechanics and Foundation Engineering' by V.N.S.Murthy ,CBS publishers
4. 'Geotechnical Engineering' by C. Venkataramaiah, New Age International Publishers.

REFERENCES:

1. 'Fundamentals of Soil Mechanics' by D.W.Taylor., Wiley.
2. 'An introduction to Geotechnical Engineering' by Holtz and Kovacs; Prentice Hall
3. Principles of Geotechnical Engineering, BrajaM.Das, Cengage Learing

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT –I: Introduction & Index Properties and Classification Tests 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.	Introduction- Soil formation	1	**30-06-2026**		**TLM1**	
2.	Structure of Soils	1	**01-07-2026**		**TLM1**	
3.	Texture of Soils	1	**03-07-2026**		**TLM1**	
4.	Three phase system: V-V Relations	1	**07-07-2026**		**TLM1**	
5.	Three phase system: W-V Relations	1	**08-07-2026**		**TLM1**	
6.	Three phase system: W-W Relations	1	**10-07-2026**		**TLM1**	
7.	Problems	1	**14-07-2026**		**TLM1**	
8.	Problems	1	**15-07-2026**		**TLM1**	
9.	Grain size analysis	1	**17-07-2026**		**TLM1**	
10.	Consistency of Clay Soils	1	**21-07-2026**		**TLM1**	
11.	Soil Classification	1	**22-07-2026**		**TLM1**	
12.	Problems	1	**24-07-2026**		**TLM1**	
No. of classes required to complete UNIT-I:12				No. of classes taken:		

UNIT-II: Soil moisture and Capillarity & Permeability

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.	Soil moisture	1	**28-07-2026**		**TLM1**	
2.	Total Pressures	1	**29-07-2026**		**TLM1**	
3.	Neutral and Effective Pressures	1	**31-07-2026**		**TLM1**	
4.	Capillary Rise in soils	1	**04-08-2026**		**TLM1**	
5.	Problems	1	**05-08-2026**		**TLM1**	
6.	Problems	1	**07-08-2026**		**TLM1**	
7.	Flow of water through soils and Darcy's law- permeability	1	**11-08-2026**		**TLM1**	
8.	Factors affecting	1	**12-08-2026**		**TLM1**	
9.	Constant head permeability test	1	**14-08-2026**		**TLM1**	
10.	Variable head permeability test	1	**18-08-2026**		**TLM1**	
11.	Permeability of layered systems	1	**19-08-2026**		**TLM1**	
12.	Problems	1	**21-08-2026**		**TLM1**	
No. of classes required to complete UNIT-II:12				No. of classes taken:		

UNIT-III: Seepage and Flow Nets & Stress Distribution 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.	Flow net for one and two dimensional flow, Basic equation for Seepage	1	**01-09-2026**		**TLM1**	
2.	Flow net Characteristics and Uses, Quicksand condition & Seepage forces	1	**02-09-2026**		**TLM1**	
3.	Problems	1	**08-09-2026**		**TLM1**	
4.	Boussinesq's theory for point loads, circular loaded areas	1	**09-09-2026**		**TLM1**	
5.	Westergaard's theories for point loads, Pressure Bulbs	1	**11-09-2026**		**TLM1**	
6.	Newmark's influence chart, 2:1 stress distribution method	1	**15-09-2026**		**TLM1**	
7.	Problems	1	**16-09-2026**		**TLM1**	
No. of classes required to complete UNIT-III:07				No. of classes taken:		

UNIT- IV: Compaction & Consolidation

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.	Mechanism of compaction, Factors affecting	1	**18-09-2026**		**TLM1**	
2.	Effects of compaction on soil properties, Compaction control	1	**22-09-2026**		**TLM1**	
3.	Problems	1	**23-09-2026**		**TLM1**	
4.	Concept of consolidation and Spring Analogy method	1	**25-09-2026**		**TLM1**	
5.	Basic definitions , e-p and e-log p curves	1	**29-09-2026**		**TLM1**	
6.	Determination of coefficient of consolidation (c_v)	1	**30-09-2026**		**TLM1**	
7.	Problems	1	**06-10-2026**		**TLM1**	
8.	Problems	1	**07-10-2026**		**TLM1**	
No. of classes required to complete UNIT-IV:08				No. of classes taken:		

UNIT-V: 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.	Basic mechanism of shear strength	1	**09-10-2026**		**TLM1**	
2.	Mohr – Coulomb Failure theories	1	**13-10-2026**		**TLM1**	
3.	Shear strength parameters, Critical Void Ratio	1	**14-10-2026**		**TLM1**	
4.	Stress-Strain behavior of clays	1	**16-10-2026**		**TLM1**	
5.	Various drainage conditions	1	**27-10-2026**		**TLM1**	
6.	Problems on Shear strength parameters for total stresses	1	**28-10-2026**		**TLM1**	
7.	Problems on Shear strength parameters for effective stresses	1	**30-10-2026**		**TLM1**	
No. of classes required to complete UNIT-V:07				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 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=15
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=15
II-Quiz Examination (Units-III, IV & V)	Q2=10
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
CIE-I (Mid-I, Assignment-I. Quiz-I)	30
CIE-II (Mid-II, Assignment-II. Quiz-II)	30
Cumulative Internal Examination (CIE): 80% best and 20% least	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**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.
PO 3	**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.
PO 4	**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.
PO 5	**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.
PO 6	**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.
PO 7	**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.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**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.
PO 11	**Project management and finance**: 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.
PO 12	**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.

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 analyze 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

Course Instructor	Course Coordinator	Module Coordinator	HOD
(B NARASIMHARAO)	(B NARASIMHARAO)	(B NARASIMHARAO)	(Dr.K.V.RAMANA)

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor	**:** Dr.V. Ramakrishna,	
Course Name & Code	**:** Construction Technology and Management (23CE13)	
Regulation	: R23	
L-T-P Structure	**: 3**-0-0	**Credits:** 03
Program/Sem/Sec	: B.Tech – V Semester – A Section	**A.Y.:** 2026-27

Pre-requisites: NIL

Course Educational Objectives:

1. To introduce the concept of project management including network drawing and monitoring
2. To illustrate the various equipments related to construction such as earth moving equipment, trucks, aggregate production, construction equipment and machinery
3. To establish the importance of various construction techniques, quality control and safety in construction projects

Course Outcomes*:* At the end of the course, the students will be able to:

CO1: Appreciate the importance of construction planning, Stakeholders involved, quality control and safety engineering in Construction projects **(Understand)**

CO2: Understand the functioning of various earthmoving equipment and construction techniques **(Understand)**

CO3: Distinguish the methods of production of aggregate products and concreting **(Understand)**

CO4: Apply the project management and construction techniques using CPM and PERT to practical problems **(Apply)**

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							1				3	1	1		
CO2							2				2	1	1		
CO3							2				2	1	1		
CO4	2						2				3	1	1		
1 - Low							**2 –**Medium						**3 -** High		

TEXTBOOKS:

1. 'Construction Engineering and Management' by S. Seetharaman, Umesh Publications, 4th Edition 2003, Reprint 2005.
2. 'Project Planning and Control with PERT and CPM', by B.C. Punmia and K.K. Khandelwal, Laxmi Publications, 4th Edition 2002, Reprint 2015.
3. 'Construction Project Management Theory and Practice' by Kumar Neeraj Jha (2011), Pearson.

4. ‘Construction Technology’ by Subir K.Sarkar and Subhajit Sarasvati, Oxford University Press.

REFERENCES:

1. ‘Construction Planning, Equipment and Methods’ by Peurifoy and Schexnayder, Shapira, Tata McGraw Hill.
2. ‘Construction Project Management-An Integrated Approach’ by Peter Fewings, Taylor and Francis
3. ‘Construction Management Emerging Trends and Technologies’ by Trefor Williams, Cengage Learning

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT–I: Introduction, Scheduling and Planning Approaches

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	1	29-06-26			
2	Construction project management (CM)	1	30-06-26			
3	Importance of CM	1	04-07-26			
4	Terminology	1	06-07-26			
5	Stake holders and Regulatory requirements	1	07-07-26			
6	Qualities of a project manager, project planning,	1	13-07-26			
7	Coordination, scheduling, monitoring	1	14-07-26			
8	Bar charts, milestone charts	1	18-07-26			
9	Network analysis	1	20-07-26			
10	Critical Path Method	1	21-07-26			
11	Critical Path Method	1	25-07-26			
12	Critical Path Method	1	27-07-26			
13	Critical Path Method	1	28-07-26			
No. of classes required to complete UNIT-I: 13				No. of classes taken:		

UNIT–II: PERT

S No	Topics to be covered	No. of classes required	Tentative date of completion	Actual date of completion	Teaching Learning Methods	HOD sign weekly
14	Project evaluation and review technique (PERT) Basics	1	01-08-26			
15	PERT Basics	1	03-08-26			
16	PERT Analysis	1	04-08-26			
17	PERT Analysis	1	08-08-26			
18	PERT Analysis	1	10-08-26			
19	Cost analysis updating crashing for optimum cost	1	11-08-26			
20	Cost analysis updating crashing	1	17-08-26			

	for optimum cost					
21	Crashing for optimum resources	**1**	**18-08-26**			
22	Software's for construction management	**1**	**22-08-26**			
23	Examples	**1**	**22-08-26**			
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT–III: Construction Equipment

S No	Topics to be covered	No. of classes required	Tentative date of completion	Actual date of completion	Teaching Learning Methods	HOD sign weekly
24	Construction equipment,	**1**	**31-08-26**			
25	economical considerations	**1**	**01-09-26**			
26	earthwork equipment	**1**	**05-09-26**			
27	earthwork equipment	**1**	**07-09-26**			
28	earthwork equipment	**1**	**08-09-26**			
29	compaction equipment	**1**	**12-09-26**			
30	Hoisting and earthwork equipment	**1**	**15-09-26**			
31	Hoisting and earthwork equipment	**1**	**19-09-26**			
32	Hoisting and earthwork equipment	**1**	**21-09-26**			
No. of classes required to complete UNIT-III: 09				**No. of classes taken:**		

UNIT–IV: Concreting Equipment

S No	Topics to be covered	No. of classes required	Tentative date of completion	Actual date of completion	Teaching Learning Methods	HOD sign weekly
33	Concreting equipment	**1**	**22-09-26**			
34	Concrete mixers	**1**	**26-09-26**			
35	Batching plants	**1**	**28-09-26**			
36	Mixing and placing of concrete	**1**	**29-09-26**			
37	Consolidating and finishing	**1**	**03-10-26**			
38	Examples	**1**	**05-10-26**			
No. of classes required to complete UNIT-IV: 06				**No. of classes taken:**		

UNIT–V: Construction Methods

S No	Topics to be covered	No. of classes required	Tentative date of completion	Actual date of completion	Teaching Learning Methods	HOD sign weekly
39	Construction methods	**1**	**06-10-26**			
40	Earthwork, piling, placing of concrete	**1**	**10-10-26**			
41	Form work, fabrication and erection	**1**	**12-10-26**			
42	Quality control	**1**	**13-10-26**			

43	Safety engineering	**1**	**17-10-26**			
44	BIM	**1**	**26-10-26**			
45	Problems	**1**	**27-10-26**			
46	Problems	**1**	**31-10-26**			
No. of classes required to complete UNIT-V: 08				**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 (R23 Regulation):

Evaluation Task	**Marks**
Internal Examination	30
Semester End Examination	70
Total Marks:	**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	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**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.
PO 3	**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.
PO 4	**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.
PO 5	**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
PO 6	**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
PO 7	**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.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**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.
PO 11	**Project management and finance**: 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.
PO 12	**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.

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 analyze the various laboratory test 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**	**HOD**
Name of faculty	**Dr V. Ramakrishna**	**Dr C. Rajamallu**	**Dr K.V. Ramana**
Signature			

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DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

PROGRAM	**:**	B.Tech., V-Sem., CIVIL
ACADEMIC YEAR	**:**	2026-27
COURSE NAME & CODE	**:**	GEOTECHNICAL ENGINEERING LAB (23CE56)
L-T-P STRUCTURE	**:**	0-0-3
COURSE CREDITS	**:**	1.5
COURSE INSTRUCTOR	**:**	B. NARASIMHARAO/K. HARISH KUMAR
COURSE COORDINATOR	**:**	B. NARASIMHARAO/ K. HARISH KUMAR

Pre-requisites: Geotechnical Engineering-I

Course Educational Objective: 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: At the end of the course, the student will be able to:
CO1: Perform the index and engineering properties of the soil and interpret the results. **(Apply- L3)**
CO2: Perform the Strength, compaction and consolidation properties of the soil and interpret the results. **(Apply- L3)**
CO3: Apply field conditions for computing and analyzing the experimental data. **(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
CO1	3	-	-	-	3	-	-	-	-	-	-	1	-	3	1
CO2	3	-	-	-	3	-	-	-	-	-	-	1	-	3	1
CO3	1	-	-	-	3	-	-	-	-	-	-	1	-	**2**	1
1 - Low						**2** –Medium							**3** - High		

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DEPARTMENT OF CIVIL ENGINEERING

GEOTECHNICAL ENGINEERING LAB (23CE56)

Course Instructor(s): B. NARASIMHARAO
K. HARISH KUMAR

B.Tech (V Sem)
A.Y 2026-27

CYCLE-1

C-1-1. Specific gravity test

C-1-2. Grainsize analysis by sieving

C-1-3. Field density test- Core cutter method

C-1-4. Field density test- Sand replacement method

C-1-5. Differential free swell test

CYCLE-2

C-2-1. Atterburg limits tests

C-2-2. Constant head permeability test

C-2-3. Compaction test by standard proctor

C-2-4. Direct shear test

C-2-5. Unconfined compression test

INCHARGE **HOD**

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DEPARTMENT OF CIVIL ENGINEERING

GEOTECHNICAL ENGINEERING LAB (23CE56)

Course Instructor(s): B. NARASIMHARAO
K. HARISH KUMAR

B.Tech (V Sem)
A.Y 2026-27

Batch-A

Tentative Date/Batch	Actual date	A1	A2	A3	A4	A5
30-06-2026		Demo	Demo	Demo	Demo	Demo
07-07-2026		Demo	Demo	Demo	Demo	Demo
14-07-2026		C-1-1	C-1-2	C-1-3	C-1-4	C-1-5
21-07-2026		C-1-2	C-1-3	C-1-4	C-1-5	C-1-1
28-07-2026		C-1-3	C-1-4	C-1-5	C-1-1	C-1-2
04-08-2026		C-1-4	C-1-5	C-1-1	C-1-2	C-1-3
11-08-2026		C-1-5	C-1-1	C-1-2	C-1-3	C-1-4
18-08-2026		Demo	Demo	Demo	Demo	Demo
01-09-2026		C-2-1	C-2-2	C-2-3	C-2-4	C-2-5
08-09-2026		C-2-2	C-2-3	C-2-4	C-2-5	C-2-1
15-09-2026		C-2-3	C-2-4	C-2-5	C-2-1	C-2-2
22-09-2026		C-2-4	C-2-5	C-2-1	C-2-2	C-2-3
29-09-2026		C-2-5	C-2-1	C-2-2	C-2-3	C-2-4
06-10-2026		Revision	Revision	Revision	Revision	Revision
27-10-2026		Internal Test				

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L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF CIVIL ENGINEERING

GEOTECHNICAL ENGINEERING LAB (23CE56)

Course Instructor(s): B. NARASIMHARAO
K. HARISH KUMAR

B.Tech (V Sem)
A.Y 2026-27

Batch-B

Tentative Date/Batch	Actual date	B1	B2	B3	B4	B5
02-07-2026		Demo	Demo	Demo	Demo	Demo
09-07-2026		Demo	Demo	Demo	Demo	Demo
16-07-2026		C-1-1	C-1-2	C-1-3	C-1-4	C-1-5
23-07-2026		C-1-2	C-1-3	C-1-4	C-1-5	C-1-1
30-07-2026		C-1-3	C-1-4	C-1-5	C-1-1	C-1-2
06-08-2026		C-1-4	C-1-5	C-1-1	C-1-2	C-1-3
13-08-2026		C-1-5	C-1-1	C-1-2	C-1-3	C-1-4
20-08-2026		Demo	Demo	Demo	Demo	Demo
03-09-2026		C-2-1	C-2-2	C-2-3	C-2-4	C-2-5
10-09-2026		C-2-2	C-2-3	C-2-4	C-2-5	C-2-1
17-09-2026		C-2-3	C-2-4	C-2-5	C-2-1	C-2-2
24-09-2026		C-2-4	C-2-5	C-2-1	C-2-2	C-2-3
01-09-2026		C-2-5	C-2-1	C-2-2	C-2-3	C-2-4
08-09-2026		Revision	Revision	Revision	Revision	Revision
29-09-2026		Internal Test				

INCHARGE **HOD**

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Ex. no's	Marks
Day to Day work = **A**	1,2,3,4,5,6,7,8,9,10	A=10
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 = 15
Cumulative Internal Examination: A + B + C = 30	1,2,3,4,5,6,7,8,9,10	30
Semester End Examinations = D	1,2,3,4,5,6,7,8,9,10	D = 70
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8,9,10	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**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.
PO 3	**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.
PO 4	**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.
PO 5	**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.
PO 6	**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.
PO 7	**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.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**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.
PO 11	**Project management and finance**: 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.
PO 12	**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.

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 analyze 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

Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
(B. Narasimharao)	(B. Narasimharao)	(B. Narasimha rao)	(Dr. K. V. RAMANA)

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF CIVIL ENGINEERING

GEOTECHNICAL ENGINEERING LAB (23CE56)

Course Instructor(s): B. NARASIMHARAO
K. HARISH KUMAR

B.Tech (V Sem)
A.Y 2026-27

LAB TIME TABLE

DAY	FN	AN
Monday		
Tuesday		**V Semester Batch-A**
Wednesday		
Thursday	**V Semester Batch-B**	
Friday		
Saturday		

Batch-A: 23761A0101, 24761A0101 to 24761A0136

Batch-B: 24761A01367 to 25765A0112

INCHARGE **HOD**

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DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

PROGRAM	:	B.Tech., V-Sem., CIVIL
ACADEMIC YEAR	:	2026-27
COURSE NAME & CODE	:	HYDRAULICS & HYDRAULIC MACHINERY LAB (23CE57)
L-T-P STRUCTURE	:	0-0-3
COURSE CREDITS	:	1.5
COURSE INSTRUCTOR	:	Mrs. P. KEERTHI/Dr. V. RAMAKRISHNA

Pre-requisites: Mechanics of Fluids, Hydraulics and Hydraulic Machinery Systems

Course Educational Objective: 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: At the end of the course, the student will be able to:

CO1	Demonstrate knowledge on the fundamental principles of fluid flow. **(Apply-L3)**
CO2	Apply the laws of conservation of mass, energy, and momentum to solve practical problems in fluid mechanics. **(Apply-L3)**
CO3	Select the required flow rate, pressure rise and the proper 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	3	-	-	3	-	-	-	-	-	-	-	-	-	2	1
CO2	3	-	-	3	-	-	-	-	-	-	-	-	-	2	1
CO3	3	-	-	3	-	-	-	-	-	-	-	-	-	2	1
1 - Low						**2** –Medium						**3 -** High			

TEXTBOOKS/REFERENCE BOOKS:
Laboratory manual developed by Civil Engineering Department

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DEPARTMENT OF CIVIL ENGINEERING

HYDRAULICS & HYDRAULIC MACHINERY LAB (23CE57)

Course Instructor(s): Mrs. P. KEERTHI
Dr. V. RAMAKRISHNA

B.Tech (V Sem)
A.Y 2026-27

CYCLE-1

C-1-1. Determination of coefficient of discharge of given Notches

C-1-2. Calibration of given Venturimeter.

C-1-3. Experiment on Orifice meter set-up

C-1-4. Determine of Darcy's Friction Co-efficient

C-1-5. Verification of Bernoulli's theorem

CYCLE-2

C-2-1. Experiment on Friction in pipes.

C-2-2. Impact of jet on vanes

C-2-3. Calibration of Turbine Flow Meter.

C-2-4. Performance characteristics of Pelton Wheel Turbine.

C-2-5. Operating characteristics of Centrifugal Pump.

IN-CHARGE **HOD**

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DEPARTMENT OF CIVIL ENGINEERING

HYDRAULICS & HYDRAULIC MACHINERY LAB (23CE57)

Course Instructor(s): Mrs. P. KEERTHI
Dr. V. RAMAKRISHNA

B.Tech (V Sem)
A.Y 2026-27

Batch-A

Tentative Date/Batch	Actual date	A1	A2	A3	A4	A5
02-07-2026		Demo	Demo	Demo	Demo	Demo
09-07-2026		Demo	Demo	Demo	Demo	Demo
16-07-2026		C-1-1	C-1-2	C-1-3	C-1-4	C-1-5
23-07-2026		C-1-2	C-1-3	C-1-4	C-1-5	C-1-1
30-07-2026		C-1-3	C-1-4	C-1-5	C-1-1	C-1-2
06-08-2026		C-1-4	C-1-5	C-1-1	C-1-2	C-1-3
13-08-2026		C-1-5	C-1-1	C-1-2	C-1-3	C-1-4
20-08-2026		Demo	Demo	Demo	Demo	Demo
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24-09-2026		C-2-4	C-2-5	C-2-1	C-2-2	C-2-3
01-10-2026		C-2-5	C-2-1	C-2-2	C-2-3	C-2-4
08-10-2026		Repetition	Repetition	Repetition	Repetition	Repetition
15-10-2026		Revision	Revision	Revision	Revision	Revision
29-10-2026		Internal Test				

IN-CHARGE **HOD**

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DEPARTMENT OF CIVIL ENGINEERING

HYDRAULICS & HYDRAULIC MACHINERY LAB (23CE57)

Course Instructor(s): Mrs. P. KEERTHI
Dr. V. RAMAKRSIHNA

B.Tech (V Sem)
A.Y 2026-27

Batch-B

Tentative Date/Batch	Actual date	B1	B2	B3	B4	B5
30-06-2026		Demo	Demo	Demo	Demo	Demo
07-07-2026		Demo	Demo	Demo	Demo	Demo
14-07-2026		C-1-1	C-1-2	C-1-3	C-1-4	C-1-5
21-07-2026		C-1-2	C-1-3	C-1-4	C-1-5	C-1-1
28-07-2026		C-1-3	C-1-4	C-1-5	C-1-1	C-1-2
04-08-2026		C-1-4	C-1-5	C-1-1	C-1-2	C-1-3
11-08-2026		C-1-5	C-1-1	C-1-2	C-1-3	C-1-4
18-08-2026		Demo	Demo	Demo	Demo	Demo
01-09-2026		C-2-1	C-2-2	C-2-3	C-2-4	C-2-5
08-09-2026		C-2-2	C-2-3	C-2-4	C-2-5	C-2-1
15-09-2026		C-2-3	C-2-4	C-2-5	C-2-1	C-2-2
22-09-2026		C-2-4	C-2-5	C-2-1	C-2-2	C-2-3
29-09-2026		C-2-5	C-2-1	C-2-2	C-2-3	C-2-4
06-10-2026		Repetition	Repetition	Repetition	Repetition	Repetition
13-10-2026		Revision	Revision	Revision	Revision	Revision
27-10-2026		Internal Test				

IN-CHARGE **HOD**

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DEPARTMENT OF CIVIL ENGINEERING

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Ex. no's	Marks
Day to Day work = **A**	1,2,3,4,5,6,7,8,9,10	A=10
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 = 15
Cumulative Internal Examination: A + B + C = 30	1,2,3,4,5,6,7,8,9,10	30
Semester End Examinations = D	1,2,3,4,5,6,7,8,9,10	D = 70
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8,9,10	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**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.
PO 3	**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.
PO 4	**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.
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PO 6	**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.
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PO 10	**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.
PO 11	**Project management and finance**: 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.
PO 12	**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.

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 analyze 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

Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
(P. Keerthi)	(P. Keerthi)	(J. Rangaiah)	(Dr. K. V. RAMANA)

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DEPARTMENT OF CIVIL ENGINEERING

HYDRAULICS & HYDRAULIC MACHINERY LAB (23CE57)

Course Instructor(s): Mrs. P. KEERTHI
Dr. V. RAMAKRISHNA

B.Tech (V Sem)
A.Y 2026-27

LAB TIME TABLE

DAY	FN	AN
Monday		
Tuesday		**V Semester Batch-B**
Wednesday		
Thursday	**V Semester Batch-A**	
Friday		
Saturday		

Batch-A: 23761A0121, 24761A0101 to 24761A0136

Batch-B: 24761A0137 to 25765A0112

IN-CHARGE **HOD**

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DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.J. Venkateswara Rao/ Dr.C. Rajamallu
Course Name & Code: Estimation, Specification and Contracts /23CES3 **Regulation**:R23
L-T-P Structure **:0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/V **A.Y.:** 2026-27

PREREQUISITE: Building planning and drawing Lab, Concrete Technology, Design of concrete structures, Design of steel structures.

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to enable the students to:

1. Understand the quantity calculations of different components of the buildings.
2. Understand the rate analysis of different quantities of the buildings components.
3. Learn various specifications and components of the buildings.

COURSE OUTCOMES (COs): At the end of the course

CO1	The student should be able to determine the quantities of different components of buildings **(Apply-L3)**
CO2	The student should be in a position of find the cost of various building components **(Apply-L3)**
CO3	The student should be capable of finalizing the value of structures **(Analyse-L4)**

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											2			2
CO2	2											2			2
CO3	2											2			2
1 - Low			**2 –**Medium								**3 -** High				

Textbooks:

1. Estimating and Costing by B. N. Dutta, UB S publishers, 2000.
2. Civil Engineering Contracts and Estimate by B.S. Patil, Universities Press (India) Pvt. Ltd., Hyd.
3. Construction Planning and Technology by Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. Estimating and Costing by G.S. Birdie.

References:

1. 'Standard Schedule of rates and standard data book' by public works department.
2. IS1200 (Parts I to XXV-1974 / Method of Measurement of Building & Civil Engg Works–B.I.S.)
3. 'Estimation, Costing and Specifications 'by M.Chakraborthi; Laxmi publications.
4. National Building Code

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Contracts- Types - Documents – Conditions	3	04-07-26		TLM 3 & 6	
2.	Valuation of buildings- concepts of e-procurement and reverse auctions	3	11-07-26		TLM 3 & 6	
3.	Standard specifications for different items of building construction.	3	18-07-26		TLM 3 & 6	
4.	General items of work in Building–Standard Units	3	25-07-26		TLM 3 & 6	
5.	Principles of working out quantities for detailed and abstract estimates	3	01-08-26		TLM 3 & 6	
6.	Approximate method of Estimating	3	08-08-26		TLM 3 & 6	
7.	Rate Analysis–Working out data for various items of work	3	22-08-26		TLM 3 & 6	
8.	Earthwork for roads and canals	3	29-08-26		TLM 3 & 6	
9.	Bar bending schedules	3	05-09-26		TLM 3 & 6	
10.	Individual wall method for one roomed building	3	12-09-26		TLM 3 & 6	
11.	Individual wall method for two roomed building	3	19-09-26		TLM 3 & 6	
12.	Individual wall method for Four roomed building	3	26-09-26		TLM 3 & 6	
13.	Centre line method for one roomed building	3	03-10-26		TLM 3 & 6	
14.	Centre line method for two roomed building	3	10-10-26		TLM 3 & 6	
15.	Centre line method for Four roomed building	3	17-10-26		TLM 3 & 6	
16.	Building estimation using building estimator software	3	24-10-26			
No. of classes required to complete: 48				**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 (R23 Regulation):

Evaluation Task	Marks
Day to Day work	10
Record	05
Internal Test	15
Cumulative Internal Examination(CIE)	**30**
Semester End Examinations (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	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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	and give and receive clear instructions.
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PSO 3	Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain

Title	**Course Instructor**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Dr.J. Venkateswara Rao/ Dr.C. Rajamallu	Dr.C. Rajamallu	Dr. K.V. Ramana
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, NTR DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

PART-A:

Program : B.Tech. V-Sem., Civil Engineering
Academic Year : 2026-27
Course Name & Code : Tinkering Lab – 23EM01
L-T-P-Cr : 0-0-2-1

Course Instructure : N Dharma Chari & Eeshwar Ram J,

Course Objectives:

1. The main objective of this course is to understand the basics of all the emerging technologies and apply the learnings to solve real-world problems
2. This is designed to be a hands-on learning program that empowers students to analyze the facts, connect the dots and apply what they learn in school rather than memorizing them which will lead to the creation of the next generation of entrepreneurs, engineers and innovators.

Course Outcomes (COs): At the end of the course, students will be able to

CO 1	Use Arduino boards for controlling various applications.	L3
CO 2	Control various applications using ESP32	L3
CO 3	Design of different real time applications using breadboard, Mobile App and 3D printer.	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
CO 1	2	3	3	2	2	1	1	-	1	-	-	1	-	2	-
CO 2	2	3	3	2	2	1	1	-	1	-	-	1	-	2	-
CO 3	2	3	3	2	2	1	1	-	1	-	-	1	-	2	-

Correlation Levels: **1**-Slight (Low), **2**-Moderate (Medium), **3**-Substantial (High) and No correlation: **'-'**

PART-B: COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered. (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Lab experiments, Cos ,Pos and PSOs.	**2**	29-06-2026		TLM4	
2.	Make your own parallel and series circuits using breadboard for any application of your choice.	2	06-07-2026		TLM4	
3.	Demonstrate a traffic light circuit using breadboard.	2	13-07-2026		TLM4	
4.	Build and demonstrate automatic Street Light using LDR.	2	20-07-2026		TLM4	
5.	Simulate the Arduino LED blinking activity in Tinkercad.	2	27-07-2026		TLM4	
6.	Build and demonstrate an Arduino LED blinking activity using Arduino IDE.	2	03-08-2026		TLM4	
7.	Interfacing IR Sensor and Servo Motor with Arduino.	2	10-08-2026		TLM4	
8.	Blink LED using ESP32	2	17-08-2026		TLM4	
9.	LDR Interfacing with ESP32.	2	24-08-2026		TLM4	
10.	Control an LED using Mobile App.	2	31-08-2026		TLM4	
11.	Design and 3D print a Walking Robot	2	07-09-2026		TLM4	
12.	Design and 3D Print a Rocket.	2	21-09-2026		TLM4	
13.	Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard.	2	28-09-2026		TLM4	
14.	Demonstrate all the steps in design thinking to redesign a motor bike.	2	05-10-2026		TLM4	
15.	Repetition	2	12-10-2026		TLM4	
16.	Internal Lab Exam	2	26-10-2026			
No. of classes required:30				**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 (R23 Regulation):

Evaluation Task	**Expt. no's**	**Marks**
Day to Day work	1,2,3,4,5,6,7,8…	A1 =10
Record and observation	1,2,3,4,5,6,7,8…	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8…	**C1=15**
Cumulative Internal Examination (CIE):(A1+B1+C1)	1,2,3,4,5,6,7,8…	**30**
Semester End Examination (SEE)	1,2,3,4,5,6,7,8…	**70**
Total Marks=CIE+SEE		**100**

Program Educational Objectives (PEOs):

PEO 1:	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education.
PEO 2:	To Function professionally in the rapidly changing world with advances in technology.
PEO 3:	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices.
PEO 4:	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner.

Program Outcomes (POs):

PO 1:	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2:	**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.
PO 3:	**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.
PO 4:	**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.
PO 5:	**Modern tool usage**: 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
PO 6:	**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

PO 7:	**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.
PO 8:	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9:	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10:	**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.
PO 11:	**Project management and finance**: 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.
PO 12:	**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):

PSO 1:	**Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
PSO 2:	**VLSI and Embedded Systems:** Design and Analyze Analog and Digital Electronic Circuits or systems and implement real time applications in the field of VLSI and Embedded Systems using relevant tools
PSO 3:	**Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor

HOD
Dr. K V Ramana

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.K.DILIP KUMAR, PROFESSOR

Course Name & Code	**:** Sustainable Energy Technologies- 23ME81	**Regulation**: R23
L-T-P Structure	**: 3-0-0**	**Credits:** 03
Program/Sem/Sec	**:**B.Tech- CE V Sem	**A.Y.:** 2026-27

PREREQUISITE **:**Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): To provide the insights on different sustainable energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and fuel cell systems.

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

CO 1	Demonstrate the importance, the impact of solar radiation. **(Understanding-L2)**
CO 2	Understand the principles of solar PV modules and storage in PV systems. **(Understanding-L2)**
CO 3	Discuss solar energy storage systems and their applications. **(Understanding-L2)**
CO 4	Describe power extraction from wind and bio-mass. **(Understanding-L2)**
CO5	Illustrate the working of geothermal, ocean energy and fuel cells. **(Understanding-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	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO2	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO3	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO4	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO5	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-

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:

T1 Renewable Energy Technologies -Ramesh & Kumar /Narosa

T2 Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

REFERENCE BOOKS:

R1. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.

R2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

R3. Non-conventional Energy Source- G S Sawhney- PHI, New Delhi, 2012

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: SOLAR RADIATION

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.	Course Outcomes	1	29-06-2026		TLM2	
2.	Role and potential of new and renewable sources	1	02-07-2026		TLM2	
3.	Role and potential of new and renewable sources	1	04-07-2026		TLM2	
4.	The solar energy option, Environmental impact of solar power	1	06-07-2026		TLM2	
5.	Structure of the Sun,	1	09-07-2026		TLM2	
6.	The solar constant, Sun-earth relationships	1	11-07-2026		TLM2	
7.	Coordinate systems	1	13-07-2026		TLM2	
8.	coordinates of the sun	1	16-07-2026		TLM2	
9.	Extraterrestrial, terrestrial solar radiation	1	18-07-2026		TLM2	
10.	Solar radiation on tilted surface	1	20-07-2026		TLM2	
11.	Instruments for measuring solar radiation sun shine, Solar radiation data	1	23-07-2026		TLM2	
No. of classes required to complete UNIT-I: 11				No. of classes taken:		

UNIT-II: SOLAR PV MODULES AND PV SYSTEMS

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.	PV module Circuit Design,	1	25-07-2026		TLM2	
2.	Module Structure,	1	27-07-2026		TLM2	
3.	Packing Density Interconnenctions,	1	30-07-2026		TLM2	
4.	Mismatch and temperature effects	1	01-08-2026		TLM2	
5.	Electrical and Mechanical Insulation,	1	03-08-2026		TLM2	
6.	Electrical and Mechanical Insulation,	1	06-08-2026		TLM2	
7.	Lifetime of PV modules,Degradation and failure	1	08-08-2026		TLM2	
8.	PV module parameters,	1	10-08-2026		TLM2	
9.	Efficiency of PV Systems	1	13-08-2026		TLM2	

10.	Solar PV Systems, Battery Operation,	1	17-08-2026		TLM2	
11.	Types of Batteries, Battery parameters, Applications,	1	20-08-2026		TLM2	
12.	Selection of batteries for Solar PV System	1	22-08-2026		TLM2	
No. of classes required to complete UNIT-II: 12				No. of classes taken:		

UNIT-III: SOLAR ENERGY COLLECTION,SOLAR ENERGY STORAGE AND APPLICATIONS

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.	Solar Energy Collection: Flat plate and concentrating collectors	1	31-08-2026		TLM2	
2.	Classification of concentrating collectors	1	03-09-2026		TLM2	
3.	Solar Energy Storage and Applications: Different methods	1	05-09-2026		TLM2	
4.	Sensible latent heat and stratified storage, Solar ponds	1	07-09-2026		TLM2	
5.	Solar Applications-solar heating cooling technique	1	10-09-2026		TLM2	
6.	Solar distillation and drying, Solar cookers	1	12-09-2026		TLM2	
7.	Central power tower concept, Solar chimney	1	17-09-2026		TLM2	
No. of classes required to complete UNIT-III: 07				No. of classes taken:		

UNIT-IV :

WIND ENERGY,BIO-MASS

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.	Wind energy: Sources and potential, Horizontal and Vertical axis wind mill	1	19-09-2026		TLM2	
2.	Performance characteristics, Betz criteria	1	21-09-2026		TLM2	
3.	Types of winds, Wind data measurement	1	24-09-2026		TLM2	
4.	Bio-mass: Principles of bio-conversion	1	26-09-2026		TLM2	
5.	Anaerobic/aerobic digestion	1	28-09-2026		TLM2	

6.	Types of biogas digesters Gas yield, Gasifiers Applications	1	01-10-2026		TLM2	
No. of classes required to complete UNIT-IV:06				No. of classes taken:		

UNIT-V : GEOTHERMAL ENERGY,OCEAN ENERGY,FUEL CELLS

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.	Geothermal Energy: Origin, Applications	1	03-10-2026		TLM2	
2.	Types of Geothermal Resources	1	05-10-2026		TLM2	
3.	Geothermal power generation, Relative merits and demerits	1	08-10-2026		TLM2	
4.	Ocean Energy: Ocean Thermal energy	1	10-10-2026		TLM2	
5.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	12-10-2026		TLM2	
6.	Challenges and applications, Fuel Cells: Introduction, Applications	1	15-10-2026		TLM2	
7.	Classification, Different types of Fuel Cells, Phosphoric Acid fuel cell ,Alkaline fuel cell, PEM fuel cell, MC fuel cell	1	17-10-2026		TLM2	
No. of classes required to complete UNIT-V: 07				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

Academic Calendar

Description	From	To	Weeks
I Phase of Instructions	29-06-2026	22-08-2026	8
I MID Examinations	24-08-2026	29-08-2026	1
II Phase of Instructions	31-08-2026	17-10-2026	7
II MID Examinations	02-11-2026	07-11-2026	1
Preparation and Practicals	09-11-2026	14-11-2026	1

Semester End Examinations	16-11-2026	28-11-2026	2

PART-C
EVALUATION PROCESS (R23 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 OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**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.
PO 3	**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.
PO 4	**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.
PO 5	**Modern tool usage**: 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
PO 6	**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
PO 7	**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.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10	**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.
PO 11	**Project management and finance**: 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.
PO 12	**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.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
PSO 3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
Dr.K.Dilip Kumar	Dr.K.Dilip Kumar	Dr.K.Dilip Kumar	Dr. M B S Sreekar Reddy