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

PROGRAM	**:**	B.Tech., V -Sem., CIVIL
ACADEMIC YEAR	**:**	2023-24
COURSE NAME & CODE	**:**	Design of Reinforced Concrete Structures (20CE12)
L-T-P STRUCTURE	**:**	2-1-0
COURSE CREDITS	**:**	3
COURSE INSTRUCTOR	**:**	Dr. K.V. Ramana
COURSE COORDINATOR	**:**	Dr. K.V. Ramana
PRE-REQUISITE	**:**	Applied Mechanics, Strength of Materials, SA

Course Educational Objective:

Learn the design principles of Working stress and Limit state designs as per IS: 456-2000,Identify the procedures of shear design parameters, Understand the design aspects of beams, slabs and columns as per IS: 456-2000

Course Outcomes: At the end of the course, the 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 the RCC beams using both working stress and limit state methods (Apply-L3)

CO3: Design the shear reinforcement and Columns subjected to axial load, uni-axial and bi-axial moments using Limit state of collapse theory (Apply-L3)

CO4: Design the different types of shallow foundations, 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	1	1	-	-	1	-	-	-	-	-	1	1	-	2
CO2	1	1	3	-	-	1	-	-	1	-	-	1	1	-	1
CO3	1	1	3	-	-	1	-	-	1	-	-	1	1	-	1
CO4	1	1	3	-	-	1	-	-	1	-	-	1	1	-	1

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 B.C.Punmia,AshokKumarJain,ArunKumarJain“ComprehensiveRCCDesign”,LaxmiPublications(P)Ltd, New Delhi, 2015.

T2 N.Krishnaraju,“AdvancedReinforcedConcretedesign”,CBSPublishers&Distributors,NewDelhi, 2005.

BOS APPROVED REFERENCE BOOKS:

1. P.C.Varghese,“LimitStateDesignofReinforcedConcrete”,PrenticeHallofIndiaPvt.,Ltd.,New Delhi, 2008.

2 .P.C.Varghese,“AdvancedReinforcedConcreteDesign”,PrenticeHallofIndiaPvt.,Ltd., NewDelhi, 2002.

3. Design of Reinforced Concrete Structures, NPTEL video lectures

ISCODES:

1. IS456-2000

2. SP – 16 (Interaction charts- rectangular & circular sections)

NOTE: These IS codes are permitted in the End Examinations

COURSE DELIVERY PLAN (LESSON PLAN): Civil

UNIT-I: DESIGN OF BEAMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	Principles of Limit State method of design	1	04-07-23		TLM-1	CO1	
2.	characteristic load and strength – Partial safety factor	1	05-07-23		TLM-1	CO1	
3.	-Limit State of collapse	2	07-07-23 08-07-23		TLM-1	CO1	
4.	balance and under reinforced–design of SRB	2	11-07-23 12-07-23		TLM-1	CO1	
5.	balance and under reinforced–design of SRB	2	14-07-23 15-07-23		TLM-1	CO1	
6.	L/d ratio for deflection calculation	1	18-07-23		TLM-1	CO1	
7.	Concept of Working Stress Method	1	19-07-23		TLM-1	CO1	
8.	Analysis and design of flexural member using working stress method	1	21-07-23		TLM-1	CO1	
9.	Design of SRB	2	22-07-23 25-07-23		TLM-1	CO1	
10.	Design of DRB	2	26-07-23 28-07-23		TLM-1	CO1	
11.	Deflection calculation	1	29-07-23		TLM-1	CO1	
12.	short term and long term deflection	2	01-08-23 02-08-23		TLM-1	CO1	
No. of classes required to complete UNIT-II:18					No. of classes taken: 18		

UNIT-II: DESIGN OF SHEAR REINFORCEMENT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
13.	Limit State of collapse – shear and torsion	1	04-08-23		TLM-1	CO2	

14.	design of a rectangular section for shear	2	05-08-23 08-08-23		TLM-1	CO2	
15.	shear-torsion and bending-torsion	1	09-08-23		TLM-1	CO2	
16.	Design for development length	1	11-08-23		TLM-1	CO2	
17.	End anchorages	1	12-08-23		TLM-1	CO2	
18.	Reinforcement details in beam for flexure,	1	15-08-23		TLM-1	CO2	
19.	shear and torsion	1	16-08-23		TLM-1	CO2	
20.	Serviceability requirements.	1	18-08-23		TLM-1	CO2	
No. of classes required to complete UNIT-II: 9					No. of classes taken: 9		

UNIT-III: DESIGN OF SLABS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
21.	Design of slabs - one way SS	2	19-08-23 22-08-23		TLM-1	CO3	
22.	Design of slabs - Two way SS	2	23-08-23 25-08-23		TLM-1	CO3	
23.	Continuous Slabs	2	26-08-23 05-09-23		TLM-1	CO3	
24.	Restrained One Way Slabs	2	06-09-23 08-09-23		TLM-1	CO3	
25.	Restrained Two Way Slabs	2	09-09-23 12-09-23		TLM-1	CO3	
26.	Numerical Problems	2	13-09-23 15-09-23		TLM-1	CO3	
No. of classes required to complete UNIT-III : 12					No. of classes taken: 12		

UNIT-IV: DESIGN OFCOLUMNS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
27.	Limit State of Collapse compression	2	16-09-23 19-09-23		TLM-1	CO4	
28.	design of columns for axial load	2	20-09-23 22-09-23		TLM-1	CO4	

29.	Numerical Problems	2	23-09-23 26-09-23		TLM-1	CO4	
30.	Reinforcement details for columns	2	27-09-23 29-09-23		TLM-1	CO4	
31.	Design of short and long columns for uni-axial.	2	30-09-23 03-10-23		TLM-1	CO4	
32.	Design of short and long columns for bi-axial	2	04-10-23 06-10-23		TLM-1	CO4	
33.	serviceability requirements	2	07-10-23 10-10-23		TLM-1	CO4	
No. of classes required to complete UNIT-IV:14					No. of classes taken: 14		

UNIT-V: DESIGN OF SHALLOW FOUNDATIONS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
34.	Design of shallow foundation	2	11-10-23 13-10-23		TLM-1	CO5	
35.	Square Footings	2	14-10-23 17-10-23		TLM-1	CO5	
36.	Rectangular Footings	2	18-10-23 20-10-23		TLM-1	CO5	
37.	isolated footing of uniform thickness	2	21-10-23 24-10-23		TLM-1	CO5	
38.	sloped footing	1	25-10-23		TLM-1	CO5	
39.	Numerical Problems	1	27-10-23		TLM-1	CO5	
40.	Revision	1	28-10-23		TLM-1	CO5	
No. of classes required to complete UNIT-V:11					No. of classes taken:		

Teaching Learning Methods					
TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

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=20
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=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

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**
(Dr. K.V.Ramana)	(Dr. K.V.Ramana)	(B.RamaKrishna)	(Dr. V.RamaKrishna)

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DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

PROGRAM	**:**	B.Tech., V -Sem., CIVIL
ACADEMIC YEAR	**:**	2023-24
COURSE NAME & CODE	**:**	H & WRE (20CE13)
L-T-P STRUCTURE	**:**	3-0-0
COURSE CREDITS	**:**	3
COURSE INSTRUCTOR	**:**	J. Rangaiah
COURSE COORDINATOR	**:**	J. Rangaiah
PRE-REQUISITE	**:**	Applied Mechanics, Mechanics of Fluids, Hydraulics and Hydraulic Machinery Systems.

Course Educational Objective:

The course allows the student to get the fundamentals of hydrology and its importance in development of water resources. The student is exposed to the different types of irrigation methods, significance of soil-water relationship, and design of irrigation channels.

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

CO1: Understand the basic concepts and factors affecting in hydrology such as Hydrologic cycle, Precipitation, Rain gauges, Runoff, Abstractions, Hydrographs, ground water geology and its occurrence.
CO2: Compute the average rainfall occurring in an area and estimate the abstractions for a given data.
CO3: Estimate the ground water potential based on available data, develop different hydrographs and analyze them for the required information.
CO4: Understand the fundamental and functional components of Irrigation, Irrigation canals and Canal lining.
CO5: Estimate the water requirements, irrigation efficiencies using fundamental principles of Irrigation, and sizing of irrigation channels using Lacey's & Kennedy theories.

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	-	-	-	-	-	-	-	-	-	-	-	2	-	1
CO2	3	-	-	-	-	-	-	-	-	-	-	-	2	-	1
CO3	3	-	-	-	-	-	-	-	-	-	-	-	2	-	1
CO4	3	-	-	-	-	-	-	-	-	-	-	-	2	-	1
CO5	3	-	-	-	-	-	-	-	-	-	-	-	2	-	1

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 Punmia.B.C, "Irrigation and Water Power Engineering," Standard Publishers, New Delhi, 1997.
T2 Santhosh Kumar Garg, "Irrigation Engineering and Hydraulics Structures," Khanna Publishers, New Delhi, 2003.

BOS APPROVED REFERENCE BOOKS:

R1 Sharma R.K., "Irrigation Engineering and Hydraulic Structures," Oxford and IBH Publishinf company, New Delhi, 1994.

R2 Modi.P.N., "Irrigation Water Resources and Water Power Engineering", standard Book House, Delhi, 1995.

R3 Subramanya.K., "Engineering Hydrology", Tata Mc Graw Hill, New Delhi, 1999.

R4 Jayarami Reddy.P., "Hydrology", Tata Mc Graw Hill, New Delhi, 1999.

COURSE DELIVERY PLAN (LESSON PLAN): Civil
UNIT-I

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Hydrology	1	05-07-23		TLM-1	CO1	T1	
2.	Engineering Hydrology & its applications	1	07-07-23		TLM-1	CO1	T1	
3.	Hydrologic cycle	1	26-07-23		TLM-1	CO1	T1	
4.	Precipitation – Types & Forms	1	10-07-23		TLM-1	CO1	T1	
5.	Types of Rain gauges	1	12-07-23		TLM-1	CO1	T1	
6.	Rain gauge Network	1	13-07-23		TLM-1	CO1	T1	
7.	Estimation of missing rainfall data	1	15-07-23		TLM-1	CO1	T1	
8.	Average rainfall over a basin	1	17-07-23		TLM-1	CO1	T1	
9.	Evaporation – factors affecting.	1	19-07-23		TLM-2	CO1	T1	
10.	Evapotranspiration – factors affecting.	1	20-07-23		TLM-1	CO1	T1	
11.	Infiltration – factors affecting.	1	22-07-23		TLM-1	CO1	T1	
12.	Tutorial	1	24-07-23		TLM-1	CO1	T1	
No. of classes required to complete UNIT-I		12			No. of classes taken:			

UNIT-II

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
13.	Runoff – factors - Components	1	26-07-23		TLM-1	CO2	R2	
14.	Runoff estimation by Infiltration Indices	1	27-07-23		TLM-1	CO2	R2	
15.	Ground water - Occurence	1	02-08-23		TLM-1	CO2	R2	
16.	Types of aquifers	1	03-08-23		TLM-1	CO2	R2	
17.	Aquifer properties - Darcy's law	1	05-08-23		TLM-1	CO2	R2	
18.	Dupuits equation - Assumptions	1	07-08-23		TLM-1	CO2	R2	
19.	Steady radial flow to wells in Confined aquifer	1	09-08-23		TLM-1	CO2	R2	
20.	problems	1	10-08-23		TLM-1	CO2	R2	
21.	Steady radial flow to wells in Unconfined aquifer	1	14-08-23		TLM-1	CO2	R2	
22.	problems	1	16-08-23		TLM-1	CO2	R2	
23.	Yield of an open well – Recuperation test.	1	17-08-23		TLM-1	CO2	R2	
No. of classes required to complete UNIT-II		11			No. of classes taken:			

UNIT-III

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
24.	Hydrograph &its components	1	19-08-23		TLM-1	CO3	R2	
25.	Separation of Baseflow	1	21-08-23		TLM-1	CO3	R2	
26.	ERH & DRH	1	23-08-23		TLM-1	CO3	R2	
27.	Unit Hydrograph - Assumptions	1	24-08-23		TLM-1	CO3	R2	

28.	Limitations & applications of UH	1	26-08-23		TLM-6	CO3	R2	
29.	Derivation of UH	1	04-09-23		TLM-1	CO3	R2	
30.	Unit hydrograph of different duration-Method of super position	1	06-09-23		TLM-1	CO3	R2	
31.	Problems	1	11-09-23		TLM-1	CO3	R2	
32.	S-curve method	1	13-09-23		TLM-1	CO3	R2	
33.	problems	1	14-09-23		TLM-1	CO3	R2	
34.	problems	1	16-09-23		TLM-1	CO3	R2	
No. of classes required to complete UNIT-III		11			No. of classes taken:			

UNIT-IV

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
35.	Necessity & importance of irrigation	1	18-09-23		TLM-2	CO4	T1	
36.	Advantages & ill effects of irrigation	1	20-09-23		TLM-2	CO4	T1	
37.	Types of irrigation	1	21-09-23		TLM-1	CO4	T1	
38.	Methods of application of irrigation	1	23-09-23		TLM-2	CO4	T1	
39.	Principal crops and crop seasons-crop rotation	1	25-09-23		TLM-1	CO4	T1	
40.	Soil-water-plant relationship	1	27-09-23		TLM-2	CO4	T1	
41.	Estimation of consumptive use-problems	1	30-09-23		TLM-1	CO4	T1	
42.	Duty & delta – factors affecting.	1	04-10-23		TLM-1	CO4	T1	

43.	Depth & frequency of irrigation	1	05-10-23		TLM-2	CO4	T1	
44.	Irrigation efficiencies	1	07-10-23		TLM-2	CO4	T1	
No. of classes required to complete UNIT-IV		10			No. of classes taken:			

UNIT-V

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
45.	Classification of canals	1	09-10-23		TLM-2	CO5	T1	
46.	Cross-section of an irrigation channel – Balancing depth	1	11-10-23		TLM-2	CO5	T1	
47.	Kennedy's theory- Design of channels	1	12-10-23		TLM-2	CO5	T1	
48.	Problems	1	14-10-23		TLM-2	CO5	T1	
49.	Lacey's regime theory – Design of channels	1	16-10-23		TLM-2	CO5	T1	
50.	Drawbacks, Comparision of Kennedy's theory & Lacey's theory	1	18-10-23		TLM-1	CO5	T1	
51.	Lining of irrigation channel-necessity, Advantages,& disadvantages	1	19-10-23		TLM-2	CO5	T1	
52.	Types of lining-	1	25-10-23		TLM-2	CO5	T1	
53.	Design of lined canal-problems	1	26-10-23		TLM-2	CO5	T1	
54.	Problems	1	28-10-23		TLM-3	CO5	T1	
No. of classes required to complete UNIT-V		10			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
55.								
56.								
57.								

Teaching Learning Methods					
TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR

Description	From	To	Weeks
I Phase of Instructions	03-07-2023	26-08-2023	8 W
I Mid Examinations	28-08-2023	02-09-2023	1 W
II Phase of Instructions	04-09-2023	28-10-2023	8 W
II Mid Examinations	30-10-2023	04-11-2023	1 W
Preparation and Practicals	06-11-2023	11-11-2023	1 W
Semester End Examinations	13-11-2023	25-11-2023	2 W

EVALUATION PROCESS (R17 Regulations):

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

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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(AUTONOMOUS)
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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 : **P. Keerthi**
Course Name & Code : 20CE14: Environmental Engineering
L-T-P Structure : 2-1-0 Credits : 3
Program/Sem/Sec : B.Tech., CE., V-Sem., Sections- A A.Y : 2023-24

PRE-REQUISITE: Environmental Studies, Applied Chemistry.

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course deals with concept of water demand and waste water quality parameters, design of water treatment units, sludge handling in waste water/sewage treatment.

COURSE OUTCOMES (COs): At the end of the course, students are able to

CO1	**Estimate** the water demand for the community and assess the significance of water/waste water, sludge quality parameters and fundamental aspects of water and waste water treatment, sludge handling (Understand – L2)
CO2	**Evaluate** the various unit operations and design the elements in sedimentation/coagulation based water treatment systems (Apply – L3)
CO3	**Illustrate** the working of filtration and disinfection systems and design them for water treatment systems (Apply – L3)
CO4	**Analyze** the various unit operations and design the primary treatment units for waste water treatment (Apply – L3)
CO5	**Analyze** the salient operational considerations in secondary biological systems and sludge handling systems and design them for waste water treatment (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	-	-	-	-	-	-	-	-	-	-	1	1	-	1
CO2	2	2		-	-	-	-	-	-	-	-	1	1	-	1
CO3	2	2		-	-	-	-	-	-	-	-	1	1	-	1
CO4	2	2		-	-	-	-	-	-	-	-	1	1	-	1
CO5	2	2		-	-	-	-	-	-	-	-	1	1	-	1

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 B.C. Punmia, A.K. Jain and A.K. Jain, "Water Supply Engineering", Laxmi Publications, 2nd edition, 1995, Reprint 2005.

T2 B.C. Punmia, A.K. Jain and A.K. Jain, "Wastewater Engineering", Laxmi Publications, 2nd edition, 1996, Reprint 2014.

REFERENCE BOOKS:

R1 S.K. Garg, "Water Supply Engineering", Khanna Publishers, 26th Revised edition, New Delhi, 2010.

R2 S.K. Garg, "Sewage Disposal and Air Pollution Engineering", Khanna Publishers, 36th Revised edition, New Delhi, 2017.

R3 H.S. Peavy, D. Rowe, and G.Tchobanoglous, "Environmental Engineering", McGraw Hill Publishers, New Delhi. 1985.

R4 K.N. Duggal, "Elements of Environmental Engineering", S.Chand & Company Limited, New Delhi, 2007.

R5 P.N. Modi, "Sewage Treatment Disposal & Waste water Engineering", Standard Book House, 2016.

R6 Manual on Sewage and Sewage treatment, CPHEEO, Ministry of urban affairs and employment, Govt. of India, New Delhi, 2001.

R7 Water and Waste water Engineering, NPTEL video lectures and web notes.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Water Demand and Water Quality

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	04.07.23		1	
2.	Need for protected water supply	1	05.07.23		1	
3.	Water demand-types	1	08.07.23		1	
4.	Factors affecting water demand	1	10.07.23		1	
5.	Fluctuations in demand	1	11.07.23		1	
6.	Population forecast -Methods	1	12.07.23		1	
7.	Population forecast	1	15.07.23		1	
8.	Sources of water	1	17.07.23		1	
9.	Physical parameters	1	18.07.23		1	
10.	Chemical parameters	1	19.07.23		2	
11.	Bacteriological parameters	1	22.07.23		2	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: Water Treatment - Sedimentation

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.	Objectives of water treatment -Methods	1	24.07.23		1	
2.	Screening, Aeration	1	25.07.23		2	
3.	Types of Settling – Stoke's law	1	26.07.23		1	
4.	Estimation of settling efficiencies of particles	1	31.07.23		1	
5.	Theory of sedimentation	1	01.08.23		1	
6.	Problems	1	02.08.23		1	
7.	Coagulation concept	1	05.08.23		2	
8.	Mechanism, types of coagulants	1	07.08.23		2	
9.	Problems	1	08.08.23		1	
10.	Jar test, Flash mixer	1	09.08.23		2	
11.	Flocculator	1	12.08.23		2	
12.	Problems	1	14.08.23		1	
13.	Clariflocculator	1	16.08.23		2	
14.	Problems	1	19.08.23		1	
No. of classes required to complete UNIT-II: 11				No. of classes taken:		

UNIT-III: Water Treatment – Filtration & Disinfection

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.	Filtration Mechanism	1	21.08.23		1	
2.	Rapid sand filter	1	22.08.23		2	
3.	Slow sand filter	1	23.08.23		2	
4.	Design & Operation	1	26.08.23		1	
5.	Comparison of SSF & RSF	1	04.09.23		1	
6.	Problems	1	05.09.23		1	
7.	Forms of disinfection	1	09.09.23		1	
8.	Types of Chlorination	1	11.09.23		1	
9.	Problems	1	12.09.23		1	
No. of classes required to complete UNIT-III: 9				No. of classes taken:		

UNIT-IV: Sewage Quality & Primary Treatment

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.	Systems of sanitation, Decomposition cycles	1	13.09.23		1	
2.	Physical parameters	1	16.09.23		1	
3.	Physical parameters	1	19.09.23		1	
4.	Chemical parameters	1	20.09.23		1	
5.	BOD rate equation	1	23.09.23		1	
6.	Problems	1	25.09.23		1	
7.	Preliminary Treatment	1	26.09.23		1	
8.	Preliminary Treatment	1	27.09.23		1	
9.	Primary sedimentation tank design	1	30.09.23		1	
10.	Problems	1	03.10.23		3	
11.	Problems	1	04.10.23		3	
No. of classes required to complete UNIT-IV: 11				No. of classes taken:		

UNIT-V: Secondary Treatment & Sludge Handling

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.	Biological growth & Processes	1	07.10.23		1	
2.	Activated sludge process	1	09.10.23		1	
3.	Complete mix process – design	1	10.10.23		1	
4.	Diffused aeration process-design	1	11.10.23		1	
5.	Trickling filter construction	1	14.10.23		1	
6.	Low rate filter, High rate filter	1	16.10.23		1	
7.	Sludge properties	1	17.10.23		1	
8.	Sludge digestion	1	18.10.23		1	
9.	Design of digester	1	21.10.23		1	
10.	Sludge dry beds	1	24.10.23		1	
11.	Problems	1	25.10.23		1	
12.	Revision	1	28.10.23		1	
No. of classes required to complete UNIT-V: 12				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 & III)	M1=15
I-Quiz Examination (Units-I, II & III)	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
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=15
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	Q=10
Cumulative Internal Examination (CIE) : A+M+Q	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	**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.

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
(P.Keerthi)	(P.Keerthi)	(J. Rangaiah)	(Dr V. Ramakrishna)

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L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
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DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: M.KARTHIK KUMAR

Course Name & Code **:** Remote Sensing and GIS **Regulation**: R20
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : III B.TECH.,/I SEM **A.Y.:** 2023-24

PREREQUISITE: NIL

COURSE EDUCATIONAL OBJECTIVES (CEOs): The course is designed to understand the techniques of Remote Sensing and GIS Technology for civil engineering applications.

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

CO1	Interpret the concepts of Photogrammetry and its applications such as determination of heights of objects on terrain. (Understand-L2)
CO2	Illustrate the Electromagnetic spectrum and utilize the energy interactions of EMR with atmosphere and earth surface features for GIS data generation (Understand-L2)
CO3	Analyze the methods of map projections and understand coordinate systems on GIS Software packages to produce high resolution thematic maps (Understand-L2)
CO4	Apply the concepts of vector and raster data model for representation of topological earth features and its importance. (Understand-L2)
CO5	Apply the RS & GIS techniques for solving civil engineering applications (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	-	-	-	-	-	-	-	-	-	-	-	2	-	1
CO2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	1
CO3	2	-	-	-	-	-	-	-	-	-	-	-	2	-	1
CO4	2	-	-	-	-	-	-	-	-	-	-	-	2	-	1
CO5	2	-	-	-	-	-	-	-	-	-	-	-	2	-	1
1 - Low					**2 –**Medium						**3 -** High				

TEXTBOOKS:

T1	Kang – Tsung Chang, "Introduction to geographic information system", Tata McGraw-Hill Education Private Limited, 2007
T2	Srivastava G.S- "An Introduction to Geoinformatics" McGraw Hill Education (India) Private Limited 2014

REFERENCE BOOKS:

R1	Sujit Choudhury, Deepankar Chakrabarti, Suchandra Choudhury, "An Introduction to Geographic Information Technology" I.K. International Publishing House Pvt. Ltd. 2009
R2	Shivangi Somvanshi, Maya Kumari, "A Introduction to Remote Sensing and Its Applications", S.K. Kataria & Sons 2014.
R3	Basudeb Bhatta, "Remote sensing and GIS" Oxford University press, 2011
R4	S. Kumar, "Basics of Remote sensing and GIS", Laxmi Publications, 2016
R4	Remote sensing and Geographical Information Technology, NPTEL video lectures and web notes

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: INTRODUCTION TO PHOTOGRAMMETRY

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 Photogrammetry	1	4-7-23		**TLM2**	
2.	Principle and types of aerial photograph	1	5-7-23		**TLM2**	
3.	Geometry of aerial photograph	1	6-7-23		**TLM2**	
4.	Image displacements	1	11-7-23		**TLM2**	
5.	Comparison of aerial photograph and map	1	12-7-23		**TLM2**	
6.	Relief displacement in aerial photography	1	13-7-23		**TLM2**	
7.	Introduction Stereoscopic, Type of stereoscope	1	15-7-23		**TLM2**	
8.	Measurement of height from photographs	1	18-7-23		**TLM2**	
9.	Aerial mosaics, Planning for mosaics	1	19-7-23		**TLM2**	
10.	Mosaic compilation, Annotation and reproduction	1	20-7-23		**TLM2**	
11.	Tutorials	1	22-7-23		**TLM3**	
No. of classes required to complete UNIT-I: 16				**No. of classes taken:**		

UNIT-II: REMOTE SENSING

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Basic concept of remote sensing	1	25-7-23		**TLM2**	
13.	Remote sensing advantages and limitations	1	26-7-23		**TLM2**	
14.	Remote sensing process	1	27-7-23		**TLM2**	
15.	Electromagnetic spectrum	1	1-8-23		**TLM2**	
16.	Energy interaction with atmosphere	1	2-8-23		**TLM2**	
17.	Energy interaction with earth surface	1	3-8-23		**TLM2**	
18.	Satellite orbits	1	5-8-23		**TLM2**	
19.	Sensor resolution	1	8-8-23		**TLM2**	
20.	India Satellite and sensor characteristics	1	9-8-23		**TLM2**	
21.	Introduction to digital data	1	16-8-23		**TLM2**	
22.	Elements of visual interpretation techniques	1	17-8-23		**TLM2**	
23.	Tutorials	1	19-8-23		**TLM3**	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: GEOGRAPHIC INFORMATION SYSTEM

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.	Introduction to GIS	1	22-8-23		TLM2	
25.	Components of a GIS	1	23-8-23		TLM2	
26.	Application areas of GIS	1	24-8-23		TLM2	
27.	Data types- Attribute data	1	26-8-23		TLM2	
28.	Spatial data representation	1	5-9-23		TLM2	
29.	Relationships of Spatial Objects	1	7-9-23		TLM2	
30.	GIS Function	1	12-9-23		TLM2	
31.	Geographic coordinate system	1	13-9-23		TLM2	
32.	Types of map, uses of maps, characteristics of maps	1	14-9-23		TLM2	
33.	Map projections ,types of projections	1	16-9-23		TLM2	
34.	Tutorials	1	19-9-23		TLM3	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV: SPATIAL DATA

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Introduction to Vector Data Model	1	20-9-23		TLM2	
36.	Representation of simple feature	1	21-9-23		TLM2	
37.	Advantages and disadvantages	1	23-9-23		TLM2	
38.	Introduction to raster data model	1	26-9-23		TLM2	
39.	Elements of the raster Data model	1	27-923		TLM2	
40.	Advantages and disadvantages	1	30-9-23		TLM2	
41.	Spatial data analysis	1	3-10-23		TLM2	
42.	Introduction overlay function	1	4-10-23		TLM2	
43.	Vector overlay function	1	5-10-23		TLM2	
44.	Raster overlay function	1	7-10-23		TLM2	
45.	Network tracing allocation	1	10-10-23		TLM2	
46.	Tutorials	1	11-10-23		TLM3	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: CIVIL ENGINEERING 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
47.	Land cover and land use	1	12-10-23		TLM2	
48.	Agricultural, forestry	1	17-10-23		TLM2	
49.	Geology, geomorphology	1	18-10-23		TLM2	
50.	Urban application	1	19-10-23		TLM2	
51.	Transportation engineering	1	21-10-23		TLM2	
52.	Hydrology	1	24-10-23		TLM2	
53.	Flood zone declination and mapping	1	25-10-23		TLM2	
54.	Ground water prospects and recharge	1	26-10-23		TLM2	
55.	Reservoir storage estimation	1	28-10-23		TLM2	
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/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):

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 problem
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	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	**M.Karthik kumar**	**M.Karthik kumar**	**J.Rangaiah**	**Dr. V. Ramakrishna**
Signature				

DEPARTMENT OF MECHANICAL ENGINEERING
COURSE HANDOUT

Part-A

PROGRAM : B.Tech., V-Sem., Civil Engineering

ACADEMIC YEAR : 2023-24

COURSE NAME & CODE : RENEWABLE ENERGY SOURCES- 20ME81

L-T-P STRUCTURE : 4-0-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : MALLIKARJUNA RAO DANDU

COURSE COORDINATOR : Dr V Dhana Raju

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): To provide the insights on different non-conventional energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and direct energy conversion systems.

COURSE OUTCOMES (COs)

After completion of the course, the student will be able to

CO1: Compute the performance of solar energy harnessing devices and its energy scenario. **(Applying– L3)**

CO2: Apply the principles of energy conversion for wind and geothermal power generating plants. **(Applying - L3)**

CO3: Compare the power generating capacities of tidal energy, wave energy and ocean thermal energy plants. **(Understanding - L2)**

CO4: Illustrate the various biomass power generation system technologies. **(Understanding - L2)**

CO5: Comprehend the direct energy power generation systems. **(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	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO2	2	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO3	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO4	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO5	1	1	-	-	-	3	3	-	-	-	-	2	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 G.D.Rai, Non-Conventional Energy Sources, 5th Edition 2011, Khanna Publishers, New Delhi, India.

T2 Kreith, F and Kreider, J. F., Principles of Solar Engineering, McGraw-Hill, 1978.

BOS APPROVED REFERENCE BOOKS:

R1 John Twidell&Tony Weir, Renewable Energy Resources – 2nd Edition, Taylor & Francis

R2 G.N.Tiwari, Solar Energy – Fundamentals, Design, Modelling and Applications –Narosa Publication Ltd.,2000.

R3 Ashok V Desai, Non-Conventional Energy- Wiley Eastern, 2000.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : GLOBAL AND NATIONAL ENERGY SCENARIO & SOLAR ENERGY HARNESSING DEVICES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Course Outcomes & Blooms Taxonomy Levels	1	10-07-2023		TLM1/ TLM2	CO1	T1	
2.	Over view of conventional & renewable energy sources	1	11-07-2023		TLM1/ TLM2	CO1	T1	
3.	Need & Development of renewable energy sources	1	13-07-2023		TLM1/ TLM2	CO1	T1	
4.	Types of renewable energy systems.	1	14-07-2023		TLM1/ TLM2	CO1	T1	
5.	Energy available from Sun	1	17-07-2023		TLM1/ TLM2	CO1	T1	
6.	Solar radiation data,	1	18-07-2023		TLM1/ TLM2	CO1	T1	
7.	Flat plate and Concentrating collectors	1	20-07-2023		TLM1/ TLM2	CO1	T1	
8.	Mathematical analysis of Flat plate collectors	1	21-07-2023		TLM1/ TLM2	CO1	T1	
9.	collector efficiency	1	24-07-2023		TLM1/ TLM2	CO1	T1	
10.	Solar water Heating, Space Heating	1	25-07-2023		TLM1/ TLM2	CO1	T1	
11.	Active and Passive heating	1	27-07-2023		TLM1/ TLM2	CO1	T1	
12.	solar stills and ponds	1	28-07-2023		TLM1/ TLM2	CO1	T1	
13.	basic principle of power generation in photovoltaic cell	1	31-07-2023		TLM1/ TLM2	CO1	T1	
14.	Problems	1	01-08-2023		TLM1/ TLM2	CO1	T1	
15.	**Quiz/Assignment**	1	03-08-2023					
No. of classes required to complete UNIT-I		14			No. of classes taken:			

UNIT-II : WIND ENERGY & GEOTHERMAL ENERGY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
16.	Wind – characteristics – wind energy conversion systems	1	04-08-2023		TLM1/ TLM2	CO2	T1	

17.	Types of wind energy	1	07-08-2023		TLM1/ TLM2	CO2	T1	
18.	Betz model & Interference factor	1	08-08-2023		TLM1/ TLM2	CO2	T1	
19.	Power Coefficient Torque Coefficient and thrust coefficient	1	10-08-2023		TLM1/ TLM2	CO2	T1	
20.	Site selection requirements.	1	11-08-2023		TLM1/ TLM2	CO2	T1	
21.	GEOTHERMAL ENERGY: Structure of Earth, Geothermal sources	1	11-08-2023		TLM1/ TLM2	CO2	T1	
22.	Hot springs, Hot Rocks& Hot Aquifers	1	14-08-2023		TLM1/ TLM2	CO2	T1	
23.	Interconnection of geothermal fossil systems	1	17-08-2023		TLM1/ TLM2	CO2	T1	
24.	Problems	1	18-08-2023		TLM1/ TLM2	CO1	T1	
25.	**Quiz/Assignment**		18-08-2023					
No. of classes required to complete UNIT-II		9			No. of classes taken:			

UNIT-III : TIDAL ENERGY, WAVE ENERGY and OCEAN THERMAL ENERGY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
26.	**Tidal Energy**- Introduction, Origin of Tides	1	21-08-2023		TLM1/ TLM2	CO3	T1, R8	
27.	Tidal Power generation	1	22-08-2023		TLM1/ TLM2	CO3	T1, R8	
28.	Classification of Tidal Power Plant,	1	24-08-2023		TLM1/ TLM2	CO3	T1	
29.	Site requirements	1	25-08-2023		TLM1/ TLM2	CO3	T1	
30.	**WAVE ENERGY**: Introduction, Wave energy and Power	1	04-09-2023		TLM1/ TLM2	CO3	T1	
31.	Wave Energy devices – Merits and Demerits	1	05-09-2023		TLM1/ TLM2	CO3	T1	
32.	**OCEAN THERMAL ENERGY**: Introduction	1	07-09-2023		TLM1/ TLM2	CO3	T1	
33.	Working principle of Ocean Thermal Energy Conversion	1	08-09-2023		TLM1/ TLM2	CO3	T1	
34.	OTEC Systems,	1	11-09-2023		TLM1/ TLM2	CO3	T1	
35.	Advantages and Disadvantages of OTEC plants.	1	12-09-2023		TLM1/ TLM2	CO3	T1	
36.	**Quiz/Assignment**		14-09-2023			CO3		
No. of classes required to complete UNIT-III		10			No. of classes taken:			

UNIT-IV : BIO – ENERGY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
37.	**BIO – ENERGY**: Introduction	1	15-09-2023		TLM1/ TLM2	CO4	T1	
38.	Biomass Energy Sources	1	19-09-2023		TLM1/ TLM2	CO4	T1	
39.	Aerobic and Anaerobic bio-conversion processes	1	21-09-2023		TLM1/ TLM2	CO4	T1	
40.	Types of Biogas plants	3	22-09-2023 25-09-2023 26-09-2023		TLM1/ TLM2	CO4	T1	
41.	Raw Materials and properties of Bio-gas	1	29-09-2023		TLM1/ TLM2	CO4	T1	
42.	Bio-gas plant Technology and Status	1	03-10-2023		TLM1/ TLM2	CO4	T1	
43.	Biomass gasification	2	05-10-2023		TLM1/ TLM2	CO4	T1	
44.	Types and application of gasifier	1	06-10-2023		TLM1/ TLM2	CO4	T1	
45.	**Quiz/Assignment**		09-10-2023			CO4		
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V : DIRECT ENERGY CONVERSION SYSTEMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
46.	DIRECT ENERGY CONVERSION SYSTEMS: Introduction	2	10-10-2023		TLM1/ TLM2	CO5	T1	
47.	Peltier effect, seebeck effect, Thomson effect,	1	12-10-2023		TLM1/ TLM2	CO5	T1	
48.	Fuel Cells-Types.	2	13-10-2023		TLM1/ TLM2	CO5	T1	
49.	Efficiency of Fuel Cells.	1	16-10-2023		TLM1/ TLM2	CO5	T1	
50.	Thermoelectric power Generation	1	17-10-2023		TLM1/ TLM2	CO5	T1	
51.	Thermionic electro power Generation	1	19-10-2023		TLM1/ TLM2	CO5	T1	
52.	MHD Generator	1	20-10-2023		TLM1/ TLM2	CO5	T1	
53.	Open and closed systems	1	26-10-2023		TLM1/ TLM2	CO5	T1	
54.	applications of direct energy energy conversion systems	1	26-10-2023		TLM1/ TLM2	CO5	T1	
55.	**Quiz/Assignment**		27-10-2023			CO5		
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

Academic Calender-A.Y-2023-24

Description	From	To	Weeks
B Tech V Semester			
Commencement of class work	03.07.2023		
I phase of Instructions	03.07.2023	26.08.2023	8
I Mid Examination	**28.08.2023**	**02.09.2023**	**1**
II phase of Instructions	04.09.2023	28.10.2023	8
II Mid Examination	**30.10.2023**	**04.11.2023**	**1**
Preparation and Practical	06.11.2023	11.11.2023	1
Semester End Examination	**13.11.2023**	**25.11.2023**	**2**

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment 1	1	A1=5
Assignment 2	2	A2=5
I-Mid Examination	1,2,3	B1=15
Quiz – 1	1,2,3	Q1=10
Assignment 3	3	A3=5
Assignment 4	4	A4=5
Assignment 5	5	A5=5
II-Mid Examination	3,4,5	B2=15
Quiz – 2	3,4,5	Q2=10
Evaluation of Assignment: A=(A1+A2+A3+A4+A5)/5	1,2,3,4,5	A=5
Evaluation of Mid Marks: B=75% of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=15
Evaluation of Quiz Marks: Q=75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	1,2,3,4,5	Q=10
Cumulative Internal Examination: A+B+Q	**1,2,3,4,5**	**CIE=30**
Semester End Examinations	**1,2,3,4,5**	**SEE=70**
Total Marks: CIE+SEE	**1,2,3,4,5**	**100**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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.
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.
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.
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.
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.
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.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
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.

PSOs

1. To apply the principles of thermal sciences to design and develop various thermal systems.
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.
3. To apply the basic principles of mechanical engineering design or 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
MALLIKARJUNA RAO DANDU	Dr V Dhana Raju	Dr. P. Vijay Kumar	Dr. S. Pichi Reddy

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

COURSE HANDOUT

PROGRAM	**:**	B.Tech., V-Sem., CIVIL
ACADEMIC YEAR	**:**	2023-24
COURSE NAME & CODE	**:**	ENVIRONMENTAL ENGINEERING LAB (20CE60)
L-T-P STRUCTURE	**:**	0-0-3
COURSE CREDITS	**:**	1.5
COURSE INSTRUCTOR	**:**	Dr.V.RAMAKRISHNA
COURSE COORDINATOR	**:**	Dr.V.RAMAKRISHNA
PRE-REQUISITE	**:**	Applied Chemistry Lab

COURSE OBJECTIVE:

This course deals with the laboratory approaches of determining certain major parameters related to water and waste water quality and analyzing the laboratory data with respect to permissible limits and field conditions.

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

CO1: Understand the underlying principles of operation, perform the different laboratory techniques for examining the water quality parameters and comment on the results obtained (Apply-L3)

CO2: Understand the underlying principles of operation and perform the different laboratory techniques for examining the wastewater quality parameters and comment on the results obtained.(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	2	2	3	2	1	1	-	1	1	1	-	2	2	2
CO2	2	3	3	2	1	1	1	-	1	1	1	-	1	2	2
CO3	2	3	3	2	1	1	1	-	1	1	1	-	1	2	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).

20CE60 – ENVIRONMENTAL ENGINEERING LAB

Course Instructor: Dr. V. RAMAKRISHNA B.Tech (V Sem)

P. KEERTHI A.Y 2023-24

CYCLE-1

C-1-1. Determination of pH value.

C-1-2. Determination of Conductivity.

C-1-3. Determination of TDS in water sample.

C-1-4. Determination of Acidity of water sample.

C-1-5. Determination of Settleable solids using Imhoff cone in sewage sample.

C-1-6. Determination of Turbidity of water sample.

CYCLE-2

C-2-1. Determination of Total, temporary and permanent hardness of water sample.

C-2-2. Determination of Calcium and Magnesium hardness of water sample.

C-2-3. Determination of Chloride concentration of water sample.

C-2-4. Determination of Alkalinity of water sample.

C-2-5. Determination of Dissolved Oxygen of water sample.(Winkler's method)

C-2-6. Determination of Total, fixed and volatile solids in sewage sample.

CYCLE-3

C-3-1. Determination of Suspended, fixed and volatile solids in sewage sample.

C-3-2. Determination of Sulphates in water sample.

INCHARGE **HOD**

20CE60 – ENVIRONMENTAL ENGINEERING LAB

Course Instructor: Dr. V. RAMAKRISHNA B.Tech (V Sem)

P. KEERTHI A.Y 2023-24

Batch-A

Tentative Date/Batch	Actual date	A1	A2	A3	A4	A5	A6
04.07.2023		Introduction	Introduction	Introduction	Introduction	Introduction	Introduction
11.07.2023		C-1-1 C-1-2	C-1-1 C-1-2	C-1-3 C-1-4	C-1-3 C-1-4	C-1-5 C-1-6	C-1-5 C-1-6
18.07.2023		C-1-3 C-1-4	C-1-3 C-1-4	C-1-5 C-1-6	C-1-5 C-1-6	C-1-1 C-1-2	C-1-1 C-1-2
25.07.2023		C-1-5 C-1-6	C-1-5 C-1-6	C-1-1 C-1-2	C-1-1 C-1-2	C-1-3 C-1-4	C-1-3 C-1-4
01.08.2023		C-2-1	C-2-2	C-2-3	C-2-4	C-2-5	C-2-6
08.08.2023		C-2-2	C-2-3	C-2-4	C-2-5	C-2-6	C-2-1
22.08.2023		C-2-3	C-2-4	C-2-5	C-2-6	C-2-1	C-2-2
05.09.2023		C-2-4	C-2-5	C-2-6	C-2-1	C-2-2	C-2-3
12.09.2023		C-2-5	C-2-6	C-2-1	C-2-2	C-2-3	C-2-4
19.09.2023		C-2-6	C-2-1	C-2-2	C-2-3	C-2-4	C-2-5
26.09.2023		C-3-1	C-3-1	C-3-1	C-3-2	C-3-2	C-3-2
03.10.2023		C-3-2	C-3-2	C-3-2	C-3-1	C-3-1	C-3-1
10.10.2023		REPEATATION LAB					
17.10.2023		REPEATATION LAB					
24.10.2023		REVISION					

20CE60 – ENVIRONMENTAL ENGINEERING LAB

Course Instructor: Dr. V. RAMAKRISHNA B.Tech (V Sem)

P. KEERTHI A.Y 2023-24

Batch-B

Date/Batch	Actual date	B1	B2	B3	B4	B5	B6
07.07.2023		Introduction	Introduction	Introduction	Introduction	Introduction	Introduction
14.07.2023		C-1-1 C-1-2	C-1-1 C-1-2	C-1-3 C-1-4	C-1-3 C-1-4	C-1-5 C-1-6	C-1-5 C-1-6
21.07.2023		C-1-3 C-1-4	C-1-3 C-1-4	C-1-5 C-1-6	C-1-5 C-1-6	C-1-1 C-1-2	C-1-1 C-1-2
28.07.2023		C-1-5 C-1-6	C-1-5 C-1-6	C-1-1 C-1-2	C-1-1 C-1-2	C-1-3 C-1-4	C-1-3 C-1-4
04.08.2023		C-2-1	C-2-2	C-2-3	C-2-4	C-2-5	C-2-6
11.08.2023		C-2-2	C-2-3	C-2-4	C-2-5	C-2-6	C-2-1
18.08.2023		C-2-3	C-2-4	C-2-5	C-2-6	C-2-1	C-2-2
25.08.2023		C-2-4	C-2-5	C-2-6	C-2-1	C-2-2	C-2-3
08.09.2023		C-2-5	C-2-6	C-2-1	C-2-2	C-2-3	C-2-4
15.09.2023		C-2-6	C-2-1	C-2-2	C-2-3	C-2-4	C-2-5
22.09.2023		C-3-1	C-3-1	C-3-1	C-3-2	C-3-2	C-3-2
29.09.2023		C-3-2	C-3-2	C-3-2	C-3-1	C-3-1	C-3-1
06.10.2023		REPEATATION LAB					
13.10.2023		REPEATATION LAB					
20.10.2023		REPEATATION LAB					
27.10.2023		REVISION					

INCHARGE **HOD**

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**
(Dr. V. RAMAKRISHNA)	(Dr. V. RAMAKRISHNA)	(J RANGAIAH)	(Dr. V. RAMAKRISHNA)

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (Autonomous)
L.B.REDDY NAGAR, MYLAVARAM-521 230, A.P, INDIA
DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

PROGRAM	**:**	B.Tech., V-Sem., CIVIL
ACADEMIC YEAR	**:**	2023-24
COURSE NAME & CODE	**:**	GIS and Computer Applications Lab (20CE61)
L-T-P STRUCTURE	**:**	0-0-3
COURSE CREDITS	**:**	1.5
COURSE INSTRUCTOR	**:**	J.Rangaiah
COURSE COORDINATOR	**:**	J.Rangaiah
PRE-REQUISITE	**:**	RS & GIS Applications, Core Civil Engineering Subjects, C Programming

COURSE EDUCATIONAL OBJECTIVE:

The course is designed to introduce GIS software and apply GIS software to simple problems in civil engineering problems. It also involves in developing coding in C language for civil engineering problems and analyzing results.

COURSE OUTCOMES (CO) :

1. Digitize and create thematic map and extract important features using GIS software.
2. Analyze and Interpret the maps created using GIS for specific applications.
3. Develop coding for civil engineering problems and analyze the results.

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															
CO2															
CO3															

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

GIS AND COMPUTER APPLICATIONS LAB (20CE61)

LIST OF EXPERIMENTS

COURSE: V SEMESTER **A.Y: 2023-24**

1. Determination of Permeability of Soil
2. Design of Irrigation Channel by Kennedy's Theory
3. Design of Flexible Pavement
4. Design of Singly Reinforced Rectangular Beam for Flexure.
5. Determination of Discharge over a Rectangular, Triangular or Trapezoidal Notch.
6. Design of Sedimentation Tank
7. Digitization of Map / Toposheet
8. Estimation of Features and Interpretation
9. Creation of Thematic Maps
10. Developing Digital Elevation Model

Lab-In charge

GIS AND COMPUTER APPLICATIONS LAB (20CE61)

COURSE: V SEMESTER **A.Y: 2023-24**

LAB SCHEDULE - BATCH- A

Sl.No	Name of the Experiment	Tentative Date	Actual Date
1	Demo	07-07-2023	
2	Determination of Permeability of Soil	14-07-2023	
3	Design of Irrigation Channel by Kennedy's Theory	21-07-2023	
4	Design of Flexible Pavement	28-07-2023	
5	Design of Singly Reinforced Rectangular Beam for Flexure.	11-08-2023	
6	Determination of Discharge over a Rectangular, Triangular or Trapezoidal Notch.	18-08-2023	
7	Design of Sedimentation Tank	25-08-2023	
8	Digitization of Map / Toposheet	08-09-2023	
9	Estimation of Features and Interpretation	15-09-2023	
10	Creation of Thematic Maps	22-09-2023	
11	Developing Digital Elevation Model	29-09-2023	
12	Revision	06-10-2023	
13	Revision	13-10-2023	
14	Internal Test	27-10-2023	

Lab-In charge

GIS AND COMPUTER APPLICATIONS LAB (20CE61)

COURSE: V SEMESTER **A.Y: 2023-24**

LAB SCHEDULE-B

Sl.No	Name of the Experiment	Tentative Date	Actual Date
1	Demo	04-07-2023	
2	Determination of Permeability of Soil	11-07-2023	
3	Design of Irrigation Channel by Kennedy's Theory	18-07-2023	
4	Design of Flexible Pavement	25-07-2023	
5	Design of Singly Reinforced Rectangular Beam for Flexure.	08-08-2023	
6	Determination of Discharge over a Rectangular, Triangular or Trapezoidal Notch.	22-08-2023	
7	Design of Sedimentation Tank	29-09-2023	
8	Digitization of Map / Toposheet	05-09-2023	
9	Estimation of Features and Interpretation	12-09-2023	
10	Creation of Thematic Maps	26-09-2023	
11	Developing Digital Elevation Model	03-10-2023	
12	Revision	10-10-2023	
13	Internal Test	17-10-2023	

Lab-In charge

GIS AND COMPUTER APPLICATIONS LAB (20CE61)

COURSE: V SEMESTER **A.Y: 2023-24**

LAB TIMETABLE

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

Batch – A: 21761A0101 to 21761A0137

Batch – B: 21761A0138 to 21761A0145 & 22765A0101 to 22765A0125

ACADEMIC CALENDAR

Description	From	To	Weeks
I Phase of Instructions	03-07-2023	26-08-2023	8 W
I Mid Examinations	28-08-2023	02-09-2023	1W
II Phase of Instructions	04-09-2023	28-10-2023	8 W
II Mid Examinations	30-10-2023	04-11-2023	1W
Preparation and Practical's	06-11-2023	11-11-2023	1 W
Semester End Examinations	13-11-2023	25-11-2023	2W

Lab-In charge

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complexengineering 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 anddesign 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 researchmethods 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 modernengineering 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 assesssocietal, 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 solutionsin 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 ofthe engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader indiverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineeringcommunity 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.
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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage inindependent 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
(J.RANGAIAH)	(J.RANGAIAH)	(J.RANGAIAH)	(Dr.V.RAMAKRISHNA)

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

COURSE HANDOUT

PROGRAM	**:**	B. Tech., V-Sem., CIVIL
ACADEMIC YEAR	**:**	2023-24
COURSE NAME & CODE	**:**	COMPUTER AIDED BUILDING DRAWING LAB (20CES2)
L-T-P STRUCTURE	**:**	1-0-2
COURSE CREDITS	**:**	2
COURSE INSTRUCTOR	**:**	**Dr. K.V.Ramana /Sri P. M. Ganga Raju**
COURSE COORDINATOR	**:**	**Dr. K.V. Ramana**
PRE-REQUISITE	**:**	Computer based engineering drawing lab and Building materials.

COURSE OBJECTIVE:

The course aims to draw different types of doors, windows and trusses using AutoCAD. The student is asked to develop and draw plan, elevation and section for different types of buildings. The student will draw a few 3D civil engineering elements

COURSE OUTCOMES:

CO1: Sketch the different sign conventions used in building drawing (Apply-L3)

CO2: Draw different views of buildings with a suitable scale (Apply-L3)

CO3: Develop 3-D view of building and staircase. (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	-	-	-	-	1	-	-	-	1	-
CO2	1	-	-	-	2	-	-	-	-	1	-	-	-	1	-
CO3	1	-	-	-	2	-	-	-	-	1	-	-	-	1	-

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

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

DEPERTMENT OF CIVIL ENGINEERING

NOTIFICATION OF CYCLES

COMPUTER AIDED BUILDING DRAWING LAB

Faculty Name: Dr. K.V.Ramana /C.RAJAMALLU subject code: 20CES2

B.Tech (V SEM) A.Y 2022-2023

CYCLE-I

1. Conventional symbols
2. English bond and Flemish bond
3. Fully Panelled Door &Window
4. Panelled and glazed door with wooden panel
5. King post and Queen post trusses
6. Single floor residential building - Plan, Elevation and Cross section
7. Storied residential building- Plan, Elevation and Cross section

CYCLE-II

8. Public building- Plan, Elevation and Cross section
9. Institutional building- Plan, Elevation and Cross section
10. Foundations- Footings
11. Steel roof truss
12. 3D view of a single floor residential building
13. 3D view of a dog legged stair case
14. 3D view of a spiral stair case

DEPERTMENT OF CIVIL ENGINEERING

NOTIFICATION OF CYCLES

COMPUTER AIDED BUILDING DRAWING LAB

I–CYCLE SCHEDULE

Date / Batch	A	A	A	A	A	A
06/7/2023	DEMO	DEMO	DEMO	DEMO	DEMO	DEMO
13/7/2023	1	1	1	1	1	1
20/7/2023	2	2	2	2	2	2
27/7/2023	3	3	3	3	3	3
03/8/2023	4	4	4	4	4	4
10/8/2023	5	5	5	5	5	5
17/8/2023	6	6	6	6	6	6
24/8/2023	Repet.	Repet.	Repet.	Repet.	Repet.	Repet.

II CYCLE SCHEDULE

Date / Batch	A	A	A	A	A	A
07/9/2023	DEMO	DEMO	DEMO	DEMO	DEMO	DEMO
14/9/2023	7	7	7	7	7	7
21/9/2023	8	8	8	8	8	8
28/9/2023	9	9	9	9	9	9
05/10/2023	10	10	10	10	10	10
12/10/2023	11	11	11	11	11	11
19/10/2023	12	12	12	12	12	12
26/10/2023	Int. Test	Int. Test	Int. Test	Int. Test	Int. Test	Int. Test

Batch A (21761A0101 to 22765A0125), **Thursday**

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Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
(Dr. K.V.Ramana)	**(Dr. K.V.Ramana)**	**(B Ramakrishna)**	**Dr.V.Ramakrishna)**