INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

CIVIL ENGINEERING

COURSE DESCRIPTOR

Course Title	**ENVIRONMENTAL ENGINEERING LABORATORY**				
Course Code	ACE112				
Programme	B.Tech				
Semester	VII	CE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	-	-	-	3	2
Chief Coordinator	Ms. Koppoli Anusha Hadassa, Assistant Professor				
Course Faculty	Ms. Koppoli Anusha Hadassa, Assistant Professor Mr. Suraj Baraik, Assistant Professor				

I. COURSE OVERVIEW:

The primary objective of an Environmental Engineering laboratory is to develop the analytical ability of the students by better understanding of the concepts in experimental engineering. The analytical experiments like determination of hardness of water, chloride content in the water, BOD and COD. Design principles of distribution system and analysis by hardy cross & equivalent pipe method, methods of conveying sewage to the treatment plant, various valves which are used in distribution system and also the characteristics of sewage and its estimation, various appurtenances in sewers, sewage disposal and farming. This course also cover the study of construction of oxidation pond, sludge digestion tank, skimming tanks, grit chambers, sedimentation tanks and designing of septic tanks and soak pits.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AHS103	I	Engineering Chemistry	1

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Environmental Engineering	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✘	Chalk & Talk	✘	Quiz	✘	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment.

Semester End Examination (SEE): The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

The emphasis on the experiments is broadly based on the following criteria:

20 %	To test the preparedness for the experiment.
20 %	To test the performance in the laboratory.
20 %	To test the calculations and graphs related to the concern experiment.
20 %	To test the results and the error analysis of the experiment.
20 %	To test the subject knowledge through viva – voce.

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 20 marks for continuous lab assessment during day to day performance, 10 marks for final internal lab assessment.

Table 1: Assessment pattern for CIA

Component	Laboratory		Total Marks
Type of Assessment	Day to day performance	Final internal lab assessment	
CIA Marks	20	10	30

Continuous Internal Examination (CIE):
One CIE exams shall be conducted at the end of the 16th week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration.

Preparation	Performance	Calculations and Graph	Results and Error Analysis	Viva	Total
2	2	2	2	2	10

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Presentation on real-world problems
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.	1	Seminar
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.	2	Seminar

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Engineering Knowledge**: Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.	1	Presentation on real-world problems
PSO 2	**Broadness and Diversity:** Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.	-	-
PSO 3	**Self-Learning and Service:** Graduates will be motivated for continuous self-learning in engineering practice and/ or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Investigate the different characteristics of water & wastewater.
II	Outline the procedure for preparations of stock and standard solutions, their handling, storage, etc.
III	Assess the suitability of water for drinking, irrigation purpose and concreting works.
IV	Determine the BOD, COD and bacterial density of portable water.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACE112.01	CLO 1	Extrapolate the knowledge of preparation of PH in water	PO 1, PO 7	2
ACE112.02	CLO 2	Use innovative methods to improve the quality of soft water for industrial purpose at cheaper cost.	PO 1,PO 4, PO 7	2
ACE112.03	CLO 3	Evaluate conductometry and conducto metric titrations	PO 1	1
ACE112.04	CLO 4	Estimate potentiometric and potentiometric titrations.	PO 1	1
ACE112.05	CLO 5	Compare the results of experiments with potentiometer	PO 1	1
ACE112.06	CLO 6	Describe PH in water	PO 1, PO 4, PO7	2
ACE112.07	CLO 7	Identify the formula for dissolved oxygen	PO 1, PO 7	3
ACE112.08	CLO 8	Explain certain properties of water using the concepts of alkalinity and acidity	PO 1, PO 4 PO7	3
ACE112.09	CLO 9	Develop theoretical aquatic chemistry basis and use the principles for the evaluation of water quality.	PO 1, PO 7	2
ACE112.10	CLO10	Describe the rate constant for a reaction and elementary steps in the reaction mechanism.	PO 1	1
ACE112.11	CLO11	Explore the basic knowledge of adsorption.	PO 1	1
ACE112.12	CLO 12	Understand principles and their practical application chromatographic separation	PO 1	1

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X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	2						2						1		
CLO 2	2			2			2								
CLO 3	1			1			2						1		
CLO 4	1												1		
CLO 5	1												1		

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 6	2			2			2								
CLO 7	3						3						2		
CLO 8	3			2			2						2		
CLO 9	2						2								
CLO 10	1												1		
CLO 11	1												1		
CLO 12	1												1		

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1,PO2,PO7 PSO1	SEE Exams	PO1,PO2,PO7 PSO1	Assignments	-	Seminars	PO2, PSO1
Laboratory Practices	PO1, PO2 ,PO7	Student Viva	-	Mini Project	-	Certification	-

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

LIST OF EXPERIMENTS	
Week-1	**INTRODUCTION TO ENVIRONMENTAL ENGINEERING LABORATORY DETERMINATION OF PH AND TURIDITY**
Batch I: To determine the pH of given samples using universal indicator, pH paper and digital pH meter Batch II: Determination of turbidity of the given sample using nephelometer in NTU	
Week-2	**DETERMINATION OF PH AND TURIDITY**
Batch I: Determination of turbidity of the given sample using nephelometer in NTU. Batch II: To determine the pH of given samples using universal indicator, pH paper and digital pH meter	
Week-3	**DETERMINATION OF CONDUCTIVITY AND TOTAL DISSOLVED SOLIDS (ORGANIC AND INORGANIC)**
Batch I: Determining the electrical conductivity of the given water sample Batch II: Determination of total dissolved solids of the sample.	
Week-4	**DETERMINATION OF CONDUCTIVITY AND TOTAL DISSOLVED SOILDS (ORGANIC AND INORGANIC)**
Batch I: Determination of total dissolved solids of the sample. Batch II: Determining the electrical conductivity of the given water sample.	

LIST OF EXPERIMENTS	
Week-5	**DETERMINATION OF ALKALINITY, ACIDITY AND CHLORIDE AND ION IN WATER**
Batch I: Determining the amount of alkalinity present in the given samples & determine the acidity of the Given sample of water Batch II: Determine the quantity of iron present in the given sample of water. .	
Week-6	**DETERMINATION OF ALKALINITY, ACIDITY AND CHLORIDE AND ION IN WATER**
Batch I: Determine the nitrate nitrogen of the given sample of water. Batch II: Determine the quantity of dissolved oxygen present in the given sample.	
Week-7	**DETERMINATION OF DISSOLVED OXYGEN AND NITRATES IN WATER**
Batch I: Determine the nitrate nitrogen of the given sample of water. Batch II: Determine the quantity of dissolved oxygen present in the given sample.	
Week-8	**DETERMINATION OF DISSOLVED OXYGEN AND NITRATES IN WATER**
Batch I: Determine the quantity of dissolved oxygen present in the given sample(s) by using modified Winkler's (azide modification) method Batch II: Determine the nitrate nitrogen of the given sample of water.	
Week-9	**DETERMINATION OF OPTIMUM COAGULANT AND CHLORIDE DEMAND.**
Batch I: Determining the optimum coagulant dosage for clarifying the given sample of water by using alum as the coagulant and performing the jar test experiment. Batch II : Determining the chlorine demand	
Week-10	**DETERMINATION OF OPTIMUM COAGULANT AND CHLORIDE DEMAND**
Batch I: Determining the optimum coagulant dosage for clarifying the given sample of water by using alum as the coagulant and performing the jar test experiment. Batch II : Determining the chlorine demand.	
WeeK-11	**DETERMINATION OF TOTAL PHOSPHORUS AND BOD**
Batch I: Determining the amount of B.O.D. exerted by the given sample Batch II: Determining the total phosphorus	
Week-12	**DETERMINATION OF C.O.D IN WATER AND TEST FOR CHLOROFORM IN WATER**
Batch I: Determining the amount of C.O.D. exerted by the given sample Batch II: Determining the most probable number (MPN) of bacterial density by E.Coli test.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Week	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Determination of ph and turbidity	CLO1	T1,T2
2	Determination of conductivity and total dissolved solids	CLO 2	T1,T2
3	Determination of alkalinity	CLO 3	T1,T2
4	Determination of water and chlorides ion in water.	CLO 4	T1,T2
5	Determination of alkalinity	CLO 5	T1,T2
6	Determination of dissolved oxygen	CLO 6	T1,T2
7	Determination of nitrates	CLO 7	T1,T2
8	Determination of optimum dose of coagulant	CLO 8	T1,T2
9	Determination of total phosphorous and BOD.	CLO 9	T1,T2
10	Determination of COD in water	CLO 10	T1,T2

Week	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
11	Determination of alkalinity	CLO 11	T1,T2
12	Determination of acidity.	CLO 12	T1,T2

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	To improve standards and analyze the concepts.	Open ended problems	PO 1	PSO 1
2	Encourage students to solve real time applications and prepare towards competitive examinations.	Open ended problems	PO 1	PSO 1

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