INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE DESCRIPTOR

Course Title	**ENGINEERING CHEMISTRY LABORATORY**				
Course Code	AHSB09				
Programme	B.Tech				
Semester	I	CSE | IT | EEE			
Course Type	Foundation				
Regulation	IARE - R18				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	-	-	-	3	1.5
Chief Coordinator	Mr. G Mahesh Kumar, Assistant Professor				
Course Faculty	Dr. C Mahendar, Professor Dr. V Anitha Rani, Associate Professor Dr. V N S R Venkateswara Rao, Associate Professor Mr. B Raju, Assistant Professor Mr. M Praveen, Assistant Professor Ms. M Malathi, Assistant Professor Ms. T Mallika, Assistant Professor Ms. M Swathi, Assistant Professor				

I. COURSE OVERVIEW:

The primary objective of an Engineering Chemistry laboratory is to develop the analytical ability of the students by better understanding the concepts experimental chemistry. The experiments carried out like conductometry, potentiometry, physical properties like adsorption of acetic acid on charcoal, viscosity and surface tension of liquids. The analytical experiments like determination of hardness of water, chloride content in the water and hydrolysis of ester cartelized by an acid can be carried out in the laboratory.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Level
-	-	-	Basic principles of chemistry laboratory	-

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Engineering chemistry laboratory	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	Seminar
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	2	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	Presentation on real-world problems

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Problem Solving:** Exploit the knowledge of high voltage engineering in collaboration with power systems in innovative, dynamic and challenging environment, for the research based team work.	1	Seminar
PSO 2	**Professional Skills:** Identify the scientific theories, ideas, methodologies and the new cutting edge technologies in renewable energy engineering, and use this erudition in their professional development and gain sufficient competence to solve the current and future energy problems universally.	-	-
PSO 3	**Modern Tools in Electrical Engineering:** Comprehend the technologies like PLC, PMC, process controllers, transducers and HMI and design, install, test, maintain power systems and industrial applications.		

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES:

The course should enable the students to:	
I	The course intends to provide an overview of the working principles and mechanism of reactions.
II	This course relies on elementary treatment and qualitative analysis and makes use of simple models and equation to illustrate the concepts involved.
III	To provide an overview of preparation and identification of organic compounds.
IV	To gain the knowledge on existing future upcoming devices, materials and methodology.

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
AHSB09.01	CLO 1	Extrapolate the knowledge of preparation of acetyl salycilic acid.	PO 1, PO 7	2
AHSB09.02	CLO 2	Use innovative methods to improve the quality of soft water for industrial purpose at cheaper cost.	PO 1, PO 2, PO 7	2
AHSB09.03	CLO 3	Evaluate conductometry and conductometric titrations	PO 1	1
AHSB09.04	CLO 4	Estimate potentiometry and potantiometric titrations.	PO 1	1
AHSB09.05	CLO 5	Compare the results of experiments with potentiometry	PO 1	1
AHSB09.06	CLO 6	Describe potentiometry and potantiometric titrations	PO 1	1
AHSB09.07	CLO 7	Identify the formula for viscosity, and explain each variable	PO 1, PO 7	3
AHSB09.08	CLO 8	Explain certain properties of water using the concepts of cohesive forces and surface tension.	PO 1, PO7	3
AHSB09.09	CLO 9	Develop theoretical aquatic chemistry basis and use the principles for the evaluation of water quality.	PO 1, PO 7	2
AHSB09.10	CLO10	Describe the rate constant for a reaction and elementary steps in the reaction mechanism.	PO 1	1
AHSB09.11	CLO11	Explore the basic knowledge of adsorption.	PO 1	1
AHSB09.12	CLO 12	Understand principles and their practical application chromatographic separation	PO 1	1

3 = High; 2 = Medium; 1 = Low

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
O 1	2						2								
CLO 2	2	2											1		
CLO 3	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 4	1														
CLO 5	1														
CLO 6	1														
CLO 7	3						2						2		
CLO 8	3						2						2		
CLO 9	2						2						1		
CLO 10	1														
CLO 11	1														
CLO 12	1														

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2, PO 7, PSO 1	SEE Exams	PO 1, PO 2, PO 7, PSO 1	Assignments	-	Seminars	-
Laboratory Practices	PO 1, PO 2, PO 7, PSO 1	Student Viva	PO 1, PO 2, PO 7, PSO 1	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	**PREPARATIONS OF ORGANIC COMPOUNDS**
Synthesis of Aspirin	
Week-2	**VOLUMETRIC ANALYSIS**
Determination of total hardness of water by complexometric method using EDTA	
Week-3	**CONDUCTOMETRIC TITRATIONS**
Estimation of an HCl by conductometric titrations.	

Week-4	**POTENTIOMETRIC TITRATIONS**
Estimation of HCl by potentiometric titrations.	
Week-5	**CONDUCTOMETRIC TITRATIONS**
Estimation of Acetic acid by Conductometric titrations.	
Week-6	**POTENTIOMETRIC TITRATIONS**
Estimation of Fe^{2+} by Potentiometry using $KMnO_4$ titrations.	
Week-7	**PHYSICAL PROPERTIES**
Determination of surface tension of a given liquid using stalagmometer.	
Week-8	**PHYSICAL PROPERTIES**
Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer	
Week-9	**VOLUMETRIC ANALYSIS OF ARGENTOMETRY**
Determination of chloride content of water by Argentometry.	
Week-10	**CHEMICAL KINETICS**
Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.	
WeeK-11	**ADSORPTION TECHNIQUES**
Verification of freundlich adsorption isotherm-adsorption of acetic acid on charcoal	
Week-12	**CHROMATOGRAPHY TECHNIQUES**
Thin layer chromatography calculation of R_f values.	

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	Synthesis of Aspirin	CLO1	T1,T2
2	Determination of total hardness of water by complexometric method using EDTA	CLO 2	T1,T2
3	Estimation of an HCl by conductometric titrations.	CLO 3	T1,T2
4	Estimation of HCl by potentiometric titrations.	CLO 4	T1,T2
5	Estimation of Acetic acid by Conductometric titrations.	CLO 5	T1,T2
6	Estimation of Fe^{2+} by Potentiometry using $KMnO_4$ titrations.	CLO 6	T1,T2
7	Determination of surface tension of a given liquid using stalagmometer.	CLO 7	T1,T2

Week	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
8	Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer	CLO 8	T1,T2
9	Determination of chloride content of water by Argentometry.	CLO 9	T1,T2
10	Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.	CLO 10	T1,T2
11	Verification of freundlich adsorption isotherm-adsorption of acetic acid on charcoal	CLO 11	T1,T2
12	Thin layer chromatography calculation of R_f values.	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

Prepared by:
Mr. G Mahesh Kumar, Assistant Professor **HOD, EEE**