K.L.University
Vaddeswaram- 522502
M.Sc., General Chemistry, I-Semester, 2016-17

Course Handout

1. Course Name : General Chemistry

2. Course Code : 16CY 1101

3. Course Coordinator : Dr. T Bhaskara Rao

4. Course Structure(LTP) :

L	T	P
4	0	0

5. Credits : 4

6. Team Members : Prof. K. Ravindra Nath

Course Description: "General chemistry is the science that systematically studies the composition, properties, and activity of organic and inorganic substances and various elementary forms of matter."

Course Objectives:

Provide in-depth understanding on the Organic and Inorganic structure determination of chemical substances using few spectroscopic techniques .To gain fundamental knowledge in crystal structures, Spectroscopy and its application. Analytical skill development for their future career in both research and industry.

7. Upon completion of the course, students will:

CO	CO	BTL
I	Classification and explanation of analytical data	2
II	Illustrate the Titrimetric Analysis	2
III	Description and Application of Visible spectrophotometry and potentiometry	2
IV	Develop the small computer codes using any one of the languages FORTRAN/C/BASIC	2

8. Course outcome Indicators:

CO#	COI-1	COI-2	COI-3
CO-I	Explain the Classification and determination of errors, Accuracy and precision	Describe the precision - Standard deviation - Standard error	Describe the Computation rules - Control charts - Regression analysis
CO-II	Classify of reactions in titrimetric analysis	Explain the theory of neutralization indicators-Mixed indicators	Explain Oxidation reduction titrations & Complex metric titrations
CO-III	Explain the Photometric titrations	Explain the spectrophotometric determinations	Explain potentiometric titrations
CO-IV	Develop the small computer codes Van der Waals equation & determination of Rate constant	Develop the small computer codes Radioactive decay	Determine the molecular weight and percentage of element organic compounds using data from experimental metal representation of molecules in terms of elementary structural features

9. Program Outcomes (Pos):

PO1. Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the conceptualization of engineering models.

PO2. Identify, formulate, research literature and solve complex engineering problems reaching sustained conclusions using first principles of mathematics and engineering sciences.

PO3. Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

PO4. Conduct investigations of complex problems including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

PO5. Create, select and apply appropriate techniques, resources and modern engineering tools including predictions and modeling, to complex engineering activities, with an understanding of the limitations.

PO6. Function effectively as an individual, and as a member or leader in diverse teams and in multi disciplinary settings.

PO7. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective report and design documentation, make effective presentation, give and receive clear instructions.

PO8. Demonstrate understanding of societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.

PO9. Understand and commit to professional ethics and responsibilities and norms of engineering practice.

PO10. Understand impact of engineering solutions in a societal context and demonstrate knowledge of and need for sustainable development.

PO11. Demonstrate a knowledge and understanding of management and business practice, such as risk and change management, and understand their limitations.

PO12. Recognize the need for, and have the ability to engage in independent and lifelong learning.

10. Mapping of Course Objectives with Programme Outcomes:

1. Highest   2. Moderate   3. Use

| Programme Outcomes (Pos) | | | | | | | | | | | |
Course Out come	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-I		1	1	1	2	1	2		1		3	1
CO-II		1	1	1	2	1	2		1		3	1
CO-III		1	1	1	2	1	2		1		2	1
CO-IV		2							2			

11. Time Table:

Day/Time	9.00-9.50	9.50-10.40	10.50-11.40	11.50-12.40	01:00 -04:00
Monday					
Tuesday					
Wednesday	Prof KR				
Thursday		Dr TBR			
Friday			Prof KR		
Saturday	Dr TBR				

12. Syllabus:

UNIT-I *Treatment of analytical data*: Classification of errors - Determinate and indeterminate errors -Minimisation of errors - Accuracy and precision - Distribution of random errors - Gaussian distribution -Measures of central tendency - Measures of precision - Standard deviation - Standard error of mean -student's t test - Confidence interval of mean - Testing for significance - Comparison of two means - F-test - Criteria of rejection of an observation - propagation of errors - Significant figures and Computation
rules - Control charts - Regression analysis - Linear least squares analysis.

UNIT-II
Titrimetric Analysis:

Classification of reactions in titrimetric analysis- Primary and secondary standards-Neutralisation titrations-Theory of neutralisation indicators-Mixed indicators-Neutralisation curves-Displacement titrations-Precipitation titrations-Indicators for precipitation titrations-Volhard method-Mohr method-Theory of adsorption indicators-Oxidation redution titrations-Change of electrode potentials during titration of Fe(II) with Ce (IV)-Detection of end point in redox titrations-Complexometric titrations-Metal ion indicators-Applications of EDTA titrations-Titration of cyanide with silver ion.

UNIT -III

Visible spectrophotometry and potentiometry - Beer-Lambert's law - deviations from Beers law -Instrumentation - Applications - Photometric titrations - Spectrophotometric determination of pK value of an indicator - Simultaneous spectrophotometric determinations -Advantages of potentiometric methods -Reference electrode - Standard hydrogen electrode . Calomel electrode -Indicator electrodes:Metal-metal ion electrodes - Inert electrodes -Membrane electrodes - theory of glass membrane potential -Direct potentiometry , potentiometric titrations – Applications.

UNIT -IV

Programming in Chemistry. Developing of small computer codes using any one of the C -languages FORTRAN/C/BASIC involving simple formulae in Chemistry, such as Van der Waals equation. Chemical kinetics (determination of Rate constant) Radioactive decay (Half Life and Average Life). Determination Normality, Molarity and Morality of solutions. Evaluation Electro negativity of atom and Lattice Energy from experimental determination of molecular weight and percentage of element

organic compounds using data from experimental metal representation of molecules in terms of elementary structural features such as bond lengths, bond angles.

13. **Self Learning Topics:**

CO	Topic	Source
I	Developing of small computer codes using C –language Chemical kinetics	T-1
II	Measures of central tendency	T-1
III	Beer-Lambert's law	T-1
IV	Mohr method-Theory of adsorption indicators-	Internet Sources
V	Direct potentiometry	Internet Sources

14. **Session / Lesson Plan**

S. No	CO	Session	Content and Source	Learning objective, End of the session student will	Teaching Methodology	Faculty Approach	Student Approach	Cognitive level expected
1	I	1	Classification of errors	Understand the necessity	Oral	Explanation	Listens and participate	Understand
2	I	2	Determinate and indeterminate errors - Minimisation of errors	Understand	Chalk and talk	Explanation	Listens and participate	Understand
3	I	3	Accuracy and precision	Understand	Chalk and talk	Explanation	Listen	Understand
4	I	4	Distribution of random errors	Apply and use	Chalk and talk	Explanation	Listen and Practice	Understand And apply
5	I	5	Gaussian distribution - Measures of central tendency	Understand	Chalk and talk	Explanation	Listen and Practice	Understand And apply
6	I	6	Measures of precision - Standard deviation	Understand	Chalk and talk	Explanation	Listen and	Understand
7	I	7	Standard error of mean student's t test - Confidence interval of mean	Understand	Chalk and talk	Explanation	Listen	Understand
8	I	8	Testing for significance - Comparison of two means - F-test	Understand	Chalk and talk	Explanation	Listen	Understand
9	I	9	Criteria of rejection of an observation - propagation of errors	Understand	PPT	Explanation	Listen	Understand
10	I	10	Significant figures and Computation	Apply and use	PPT	Explanation	Listen	Apply and use

			rules -					
11	I	11	Control charts	Apply and use	Chalk and talk	Explanation	Listen and practice	Apply and use
12	I	12	Regression analysis - Linear least squares analysis	Apply and use	Chalk and talk /PPT	Explanation	Listen	Apply and use
13	II	13	Primary and secondary standards-Neutralisation titrations	Understand	Chalk and talk / PPT	Explanation	Listen and analyze	Understand
14	II	14	Theory of neutralisation indicators	Understand	Chalk and talk	Explanation	Listen	Understand
15	II	15	Mixed indicators-Neutralisation curves-Displacement titrations	Understand	Chalk and talk	Explanation	Listen	Understand And remember
16	II	16	Volhard method-Mohr method	Understand	Chalk and talk	Explanation	Listen	Understand And remember
17	II	17	Theory of adsorption indicators-Oxidation redution titrations	Analyze	Chalk and talk /PPT	Explanation	Listen and practice	Analyze
18	II	18	Change of electrode potentials during titration of Fe(II) with Ce (IV)-	Analyze	Chalk and talk	Explanation	Listen and practice	Analyze
19	II	19	Detection of end point in redox titrations	Understand, Analyze	Chalk and talk	Explanation	Listen and practice	Understand and Analyze
20	II	20	Complexometric titrations	Understand, Analyze	Chalk and talk	Explanation	Listen and practice	Understand and Analyze
21	II	21	Metal ion indicators	Understand	Chalk and talk / PPT	Explanation	Listen	Understand
22	II	22	Applications of EDTA titrations	Understand	Chalk and talk	Explanation	Listen and practice	Understand and Analyze
23	II	23	Titration of cyanide with silver ion	Analyze	Chalk and talk	Explanation	Listen and practice	Analyze
24	III	24	Beer-Lambert's law	Analyze	Chalk and talk	Explanation	Listen	Analyze
25	III	25	deviations from Beers law -Instrumentation	Apply and use	Chalk and talk / PPT	Explanation	Listen	Apply and use
26	III	26	Applications - Photometric titrations	Apply and use	Chalk and talk / PPT	Explanation	Listen	Apply and use
27	III	27	Spectrophotometric determination of pK value of an indicator	Understand	Chalk and talk	Explanation	Listen and participate	Understand
28	III	28	Simultaneous spectrophotometric determinations -	Apply and use	Chalk and talk	Explanation	Listen and participate	Apply and use
29	III	29	Advantages of potentiometric methods	Apply and use	Chalk and talk	Explanation	Listen	Apply and use
30	III	30	Reference electrode - Standard hydrogen electrode .	Understand	Chalk and talk	Explanation	Listen and participate	Understand

31	III	31	Calomel electrode - Indicator electrodes:Metal-metal ion electrodes	Understand	Chalk and talk	Explanation	Listen	Understand
32	III	32	Inert electrodes - Membrane electrodes	Understand	Chalk and talk	Explanation	Listen	Understand
33	III	33	theory of glass membrane potential -Direct potentiometry	Understand	Chalk and talk	Explanation	Listen	Understand
34	III	34	potentiometric titrations Applications.	Apply and use	Chalk and talk	Explanation	Listen	Apply and use
35	IV	35	Developing of small computer codes Van der Waals equation	Understand	Chalk and talk	Explanation	Listen and participate	Understand
36	IV	36	Chemical kinetics (determination of Rate constant) Radioactive decay (Half Life and Average Life).	Understand	Chalk and talk	Explanation	Listen	Understand
37	IV	37	Determination Normality, Molarity and Morality of solutions	Understand	Chalk and talk	Explanation	Listen	Understand
38	1V	38	Evaluation Electro negativity of atom and Lattice Energy	Understand	Chalk and talk	Explanation	Listen	Understand
39	1V	39	molecular weight and percentage of element organic compounds using data from experimental metal representation of molecules in terms of elementary structural features such as bond lengths	Apply and use	Chalk and talk	Explanation	Listen	Apply and use
40	IV	40	molecular weight and percentage of element organic compounds using data from experimental metal representation of molecules in terms of elementary structural features such as bond angles.	Understand	Chalk and talk	Explanation	Listen and participate	Understand

Evaluation scheme:

EVALUATION PLAN FOR COURSES (16CY1101-Genaral Chemistry)

Evaluation Component	Marks	Weightage	Date	Duration (Hours)	CO 1		CO 2		CO 3		CO 4	
		Course Outcome Indicator Number			1	2	1	2	1	2	1	2
		Blooms Taxonomy Level			1	2	2	2	2	2	1	2
Assignment Test	20	5 %		1 ½	10	10						
Test 1	20	20%*		1 ½			10	10				
Test 2	20			1 ½					10	10		
Home Assignment	20	5%		-							10	10
Quiz	20	5%		20 min	5		5		5		5	
Attendance	5	5%	----		75% of Theory+25% of lab attendance.							
Semester End Exam	60	60%		3	2	10.5	2	10.5	2	10.5	2	10.5
					3	12	3	12	3	12	3	12

* 75 % of the Best and 25% of other test together will be taken for 20 marks, internal.

<u>**TEST PATERN:**</u>

1. **Assignment Test**: 6 Questions will be given in advance and any two questions of the Faculty choice have to be answered.

2. **TEST1 & 2**: It comprises two sections: **Section-1**: 6 short answer question of 1 mark each are to be answered (no choice). **Section-2**: 2 questions of 7 marks each out of 3 questions have to be answered, totaling to 20 marks. **75 % of the Best and 25% of other test together will be taken for 20 marks, internal.**

3. **Home Assignment**: Two Questions will be given for 10 marks each and to be submitted on or before submission date announced by the faculty in the class.

4. **Quiz:** 20 Objective Questions will be given for 10 marks and to be answered in 20 minutes.

5. **Semester End exam**: Four questions with internal choice 4x15=60

Chamber consultation hours: Saturday: 12:40 PM- 2:20PM
Tuesday: 12:40 PM- 2:20PM

16. Notices:
All notices regarding course matters will be displayed in e-learning site & copy of it in department notice board.

Note:

a. Each student is required to attend all classes regularly with calculator and is required to complete all the work assigned for the course.
b. Instructors of courses are not obligated to provide make-up opportunities for students who are absent, unless the absence has been officially approved. An

officially approved absence, however, merely gives the individual who missed the class an opportunity to make up the work and in no way excuses him from the work.

c. Re conduction of tests will not be entertained, whatever may be the reason. Submission of home assignments after the deadline will not be either accepted or awarded any marks.

d. All students in the class must treat others with civility and respect and conduct themselves during class sessions in a way that does not unreasonably interfere with the opportunity of other students to learn. Failure to comply with this requirement may result in points being deducted from a student's final numerical average / soft skills.

17. Signature of the Course Coordinator:

18. Signature of the Group Head:

19. Signature of the HOD: