P. R. GOVERNMENT COLLEGE (A), KAKINADA

B. Sc. (Analytical Chemistry)

SEMESTER –I

Paper I (ANALYTICALCHEMISTRY-1)60hrs (4h/w)

BASIC PRINCIPLES & LABORATORYOPERATIONS

UNIT – I   **12hrs**

A. SI Units:

i) Definitions of the Seven Base Units (Mass, Length, Time, Temperature, Amount of substance, Electrical current and Luminous intensity).

ii) Derived units, Conversion between units.

B. Chemical concentrations:

i) Mole, Molar mass

ii) Calculations in grams and moles

iii) Solutions and their concentrations:

iv)   a) Molar concentration

    b) Analytical molarity

c) Equilibrium molarity of a particular species

    d) Percent concentration

e) Parts per million/billion (ppm, ppb)

f) Volume ratios for dilution procedures,

g) p-functions.

C. Preparation of solutions: standard solutions, primary standards, secondary standards and their preparations.

UNIT – II   **12hrs**

INTRODUCTION TO ANALYTICAL CHEMISTRY AND
ANALYTICAL METHODS –I:

i) General steps in chemical analysis

ii) Introduction to methods of detecting analytes Physical, Electromagnetic radiations and Electric charge

iii) Single pan analytical balance: (operation and theory of the balance, construction details, errors in weighing, care of an analytical balance).

UNIT III   12hrs

INTRODUCTION TO ANALYTICAL CHEMISTRY AND ANALYTICAL METHODS – II:

A. Description and use of common laboratory apparatus:

   i). Volumetric flasks, burettes, pipettes,

   ii). Meniscus readers, weighing bottles, funnels, desiccators, drying ovens, filter crucibles, rubber policeman.

   iii). Calibration of volumetric glass ware – Volumetric flask, Burette and Pipette.

B. pH meter: components of pH meter, use of pH Meter, maintenance of pH meter, applications.

UNIT-IV   12hrs

ERRORS IN CHEMICAL ANALYSIS:

i). Accuracy and Precision, Absolute and relative uncertainty, Types of errors

ii). Significant figures and Computation rules

iii). The Gaussian distribution, mean and standard deviation.

iv). Statistical tests of data (the F test, the t test, Q test for bad data).

v). Safety with chemicals and waste in Laboratory.

UNIT – V

PRINCIPLES OF THERMOGRAVIMETRY: 12hrs

Thermal methods of analysis

i). Principles of TGA, application of TGA to $CaC_2O_4.H_2O$.

ii). Principles of DTA, Application of DTA to $(CH_3COO)_2$ Ca. H_2O.

iii). Thermometric titrations and application of Thermometric titrations

(HCl vs. NaOH Thermometric titrations).

P. R. GOVERNMENT COLLEGE (A), KAKINADA
B. Sc. (Analytical Chemistry -1)
SEMESTER –I

LABORATORYCOURSE-I   **30** hrs (2 h /w)

Practical-I   (At the end of Semester-I)   Max Marks:50 M

1.   Calibration of volumetric equipment:

     i.   Volumetric flasks,

     ii.   Pipette's

     iii.   Burettes.

2.   Preparation of standard solutions:
     i.   Preparation of standard acid solutions
     ii.   Preparation of standard base solutions

3.   Estimation of sodium carbonate by titrating with hydrochloric acid (HCl).

4.   Preparation of standard EDTA solution.

5.   Preparation of buffer solutions.

6.   Determination of HCl by using standard NaOH solution

SUGGESTED BOOKS

1. Seamus P.J. Higson: Analytical Chemistry.
2. Douglas A. Skoog and Donald M. West: Fundamentals of Analytical Chemistry.
3. Adion A. Gordus: Schaum's Outline of Analytical Chemistry, Tata McGraw-Hill.
4. Gary D. Christian: Analytical Chemistry.
5. Freifelder and Kealy: Analytical Chemistry.
6. Daniel C Harris: Exploring Chemical Analysis.
7. Daniel C Harris: Quantitative Chemical Analysis.

SCHEME OF VALUATION

Max. Marks: 50

I.   Procedure to be written in the first 15 minutes   ….   10 Marks

II.   Recording of data and reporting the value upto 2% error……   20 Marks

III. Error up to 5%   ……….   10 Marks

     Error greater than 5%   ……   5 Marks

IV.   Viva – Voice   ………   10 Marks

V.   Record   ………   10 Marks

<u>**Duration: 2hrs. 30Min.**</u>   <u>**Max. Marks: 50**</u>

SECTION – A

Answer any **THREE** questions. Each question carries **10** marks.   3 X 10 = 30M

1. Any Question from Unit –I

2. Any Question from Unit –I

3. Any Question from Unit –II

4. Any Question from Unit – II

5. Any Question from Unit – IV

6. Any Question from Unit - V

SECTION – B

Answer any **FOUR** questions. Each question carries **5** marks.   4 x 5 = 20M

7. Any Question from Unit - I

8. Any Question from Unit – II

9. Any Question from Unit – III

10. Any Question from Unit – IV

11. Any Question from Unit – V

12. Any Question from Unit – II

13. Any Question from Unit – IV

P. R. GOVERNMENT COLLEGE, KAKINADA
SEMESTER – I
Paper -I (ANALYTICAL CHEMISTRY -1)
(BASIC PRINCIPLES AND LABORATORY OPERATIONS)

Blue print;

1.

S. No.	Course Content	Essay Questions (10M)	Short Answer Questions (5M)	Total No. Of Questions from each Unit
1	**Unit –I**	**2**	**1**	**3**
2	**Unit –II**	1	2	3
3	**Unit –III**	1	1	2
4	**Unit –IV**	1	2	3
5	**Unit –V**	**1**	**1**	**2**
	TOTAL	**6**	**7**	**13**

Note: Questions should be given from Question bank

QUESTION BANK

ESSAY QUESTIONS – 10 Marks

1. Explain Primary standard solutions with examples and Write the experimental procedure for preparation of a primary standard solution.

2. Explain Secondary standard solutions with examples and Write the experimental Procedure for Preparation of a secondary standard solution.

3. What are Standard Solutions? Explain Primary and Secondary standard solutions with examples.

4. Explain the methods of detecting analytes based on Physical means and Electromagnetic radiations.

5. Explain the methods of detecting analytes based on Electromagnetic radiations and Electric Charge.

6. What is an analyte? Explain the different methods of detecting analytes.

7. Explain briefly about Single pan analytical balance.

8. Explain about the Calibration of volumetric glass ware.

9. Explain about the description and use of

i). Volumetric flask, ii). Burette and iii). Pipette.

10. Explain in detail about the pH meter and its components

11. What are Significant figures? Write the computation rues for significant figures.

12. Write the Principles and applications of Thermometric titrations

13. Explain the Principle, Experimental set up and application of TGA

14. Explain the principle, Experimental set up and application of DTA

QUESTION BANK

SHORT ANSWER QUESTIONS –05MARKS:

1. What are Base units? Explain briefly

2. Explain briefly about Derived units.

3. Explain about Mole and Molar mass

4. Explain about the Molar concentration, Analytical Molarity and Equilibrium
   Molarity

5. Explain about the Percent concentration, Parts Per Million (ppm) and p- functions.

6. Write about the General steps involved in chemical analysis.

7. What is analyte? Explain briefly about the methods of detecting analytes.

8. Explain briefly about Care and errors in weighing in Analytical balance

9. Describe briefly about any two common laboratory glassware items.

10. Write the uses of common Laboratory apparatus.

11. Write the use and applications of pH Meter

12. Write about the description and use of Weighing bottle and Funnel

13. Write briefly about Safety with chemicals and waste in Laboratory.

14. Explain about Mean and Standard deviation.

15. Explain briefly about Accuracy and Precision.

16. Explain about the Gaussian distribution.

17. Explain briefly about F test and t - test.

18. Explain briefly about Thermometric titrations

19. What are Thermal methods? Explain briefly.