



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Science College  
Semester-3(B.Sc)

**Subject:** Analytical Chemistry- BSCCM13308

**Type of course:** Major

**Prerequisite:** Students should have a basic knowledge about Analytical Chemistry.

**Rationale:** The Prerequisite provide the foundation for understanding the concepts and principle of Analytical chemistry.

### Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
3	0	2	4	75	25	30	20	50	200

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*

### Course Content:

Unit No.	Course content	Hrs	% Weight age
1	<b>Errors</b> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Sources of errors,</li> <li>• Classification of errors,</li> <li>• Methods of minimizing errors</li> <li>• Accuracy, precision and significant figures.</li> <li>• Limit Test for chloride, sulphate and iron.</li> </ul>	10	25



2	<b>Acid base titration:</b> <ul style="list-style-type: none"> <li>Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves</li> <li>Non aqueous titration: Solvents, acidimetry and alkalimetry titration</li> <li>Estimation of Sodium benzoate and Ephedrine HCl.</li> </ul>	10	25
3	<b>Redox titrations</b> <ul style="list-style-type: none"> <li>Concepts of oxidation and reduction</li> <li>Types of redox titrations (Principles and applications)</li> <li>Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate</li> </ul>	10	25
4.	<b>Conductometry and Potentiometry</b> <ul style="list-style-type: none"> <li>Electrochemical methods of analysis</li> <li>Conductometry- Introduction, Conductivity cell, Conductometric titrations, Applications.</li> <li>Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.</li> </ul>	15	25

### Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	<b>pH Measurement of Everyday Substances</b> Ask students to measure the pH of everyday substances using potentiometric methods. This can include solutions like lemon juice, milk, or various cleaning products. Students compare their potentiometric measurements with those obtained using traditional pH indicators, fostering an understanding of the advantages and limitations of potentiometry. Upload the result on GMIU web Portal.	10
2.	<b>Conductivity of Common Substances</b> Provide students with a variety of common substances (e.g., saltwater, sugar solution, vinegar, etc.) and ask them to predict and test the conductivity of each. Upload the result on GMIU web Portal.	10
3.	<b>Concept Mapping of Redox Titrations</b> Student needs to create a concept map that connects the various types of redox titrations (cerimetry, iodimetry, iodometry, etc.) with their principles	10





	and applications and upload it on GMIU web portal.	
4.	<b>Project:</b> Students need to prepare small project into groups (3 students per group) given by the faculty.	10
5.	Attendance	10
<b>Total</b>		<b>50</b>

**List of Practical:**

Sr. No.	Descriptions	Unit No.	Hrs.
1.	Determination of cell constant, and determination of dissociation constant of weak acid by conductometry (N/10 CH <sub>3</sub> COOH).	1	2
2.	Determination of solubility and solubility-product of given sparingly soluble salt by conductometry using Pb(NO <sub>3</sub> ) <sub>2</sub> and K <sub>2</sub> SO <sub>4</sub> .	2	2
3.	Determination of degree of hydrolysis of given NH <sub>4</sub> Cl salt from its given standard solution by pH-metry.	3	2
4.	Determination of amount of Ni <sup>2+</sup> ion in given solution by colorimeter.	4	2
5.	Determination of Strength of FeSO <sub>4</sub> (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> .6H <sub>2</sub> O solution by using standard K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> solution by potentiometric method.	5	2
6.	Determination of viscosity of pure liquids A and B, and their different percentage compositions and determination of composition of unknown mixture of A and B.	6	2
7.	Study of inversion of sucrose in presence of 1N HCl and determination of the order of the reaction by polarimeter.	7	2
8.	To determine of surface tension and parachor of given three different organic liquid by dropping method.	8	4
9.	Chromatographic separation of metal ions: - Cu <sup>2+</sup> , Ni <sup>2+</sup> and Co <sup>2+</sup> and find out R <sub>f</sub> Value.	9	6
10.	To investigate the reaction between potassium bromate and potassium iodide.	10	6
<b>TOTAL</b>			<b>30</b>



**Suggested Specification table with Marks (Theory):75**

<b>Distribution of Theory Marks</b> (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weight age	30%	40%	30%	00	00	00

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Course Outcome:**

<b>After learning the course the students should be able to:</b>	
CO1	Interpret the different types of errors.
CO2	Demonstrate the acid – base titrations.
CO3	Analyze a wide range of inorganic analytes.
CO4	Summarize the electrochemical methods.

**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

**Reference Books:**

- [1] Fundamentals of Analytical Chemistry by Stanley R. Crouch.
- [2] Analytical Chemistry by Gary Christian.
- [3] Concepts in Analytical Chemistry by S.M. Khopkar.
- [4] Analytical Chemistry and Quantitative Analysis by David S. Hage.

