Gyanmanjari Innovative University

Syllabus
Gyanmanjari Science College
Semester-1 (B.Sc)

Subject: Basic Chemistry-BSC1FS11301

Type of course: Major (Core)

Prerequisite: To provide students with the fundamental knowledge of chemistry that is essential for understanding the world around them.

Rationale: By understanding the principle of chemistry, Students can gain a deeper understanding of everything from the food they eat to the air they breathe.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks		Total Marks
CI	T	P	C	SEE	CCE	
2	0	4	4	100	100	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

Course Content:

Sr. No	Course Content	Hrs.	% Weightage
1	**Atomic structure:** ▪ Electronic configuration - Aufbau principle - Pauli's exclusion principle- Hund's rule. Bonding Electrovalent, covalent, hydrogen bonds Orbital overlap - s-s, s-p. **Practical:** ▪ Students aware about laboratory, including Glassware how to handle it, basic practical to perform different types of test in lab.	T:P 6:12	20%

Evaluation Methods

Sr. No	Evaluation Methods	SEE	CCE
1	Bonds Identification Challenge	10	
2	Hands-On Dimensions	10	
3	Concept Capsule		10
4	Journal		10
	Total	**20**	**20**

Rubrics:

Bonds Identification Challenge:

Faculty will provide unknown samples to students and they have to identify the sample.

Hands-On Dimensions:

Students can use Tool like- MolView (Free & Online) to Create Dimensions molecule and see bonding structures.

Website: https://molview.org/

Concept Capsule:

Students create a 1-minute video explaining:Aufbau's Principle or Hydrogen bonding in H_2 O, using phone camera. Evaluation based on concept clarity, creativity, and presentation.

2

Molecular Orbital Theory:

- Formation of bonding and anti bonding molecules orbitals, bond order, order of energy for molecular orbitals. Molecular orbital diagram of homo nuclear diatomic molecules. Molecular orbital diagram of molecules and ions.

Practical:

- Perform Inorganic qualitative analysis to understand different types of bonds.

T:P 6:12

20%

Evaluation Methods

Sr. No	Evaluation Methods	SEE	CCE
1	**ALA: Investigating Adsorption on solid Surfaces** To investigate how		10

			different variables affect the adsorption of a substance onto a solid surface prepares report and upload on GMIU web portal.				
		2	Molecular Building Structure	10			
		3	Brainwave Session	10			
		4	MO Mystery: Identify & Explain		10		
			Total	20	20		

Rubrics:

Molecular Building Structure: Faculty will Provide Topics related to MOT & Students have to create PPT with 3D Structures of molecules.

Brainwave Session - Students will decode molecular structures that will be given by faculty in slides.

MO Mystery: Identify & Explain- Faculty will Use physical or visual models & students have to -

- Recognize bonding and anti-bonding orbitals
- Identify correct molecular orbital diagrams
- Calculate bond order
- Predict magnetic behavior
- Differentiate between molecules and ions based on MO models.

3

Surface chemistry:

- Introduction of surface chemistry. Concept of adsorption, Freundlich's adsorption isotherm and its limitations. Langmuir's adsorption isotherm. Physical adsorption and chemical adsorption. Applications of adsorption.

Practical :

- Different types of practical which involve adsorption reaction.

T:P 6:12

20%

Evaluation Methods

Sr. No	Evaluation Methods	SEE	CCE
1	**ALA:** DIY- Product Development		10
2	Practical Experiments on Adsorption	10	

		3	Exploring the role of catalysts in the Decomposition of Hydrogen Peroxide	10		
		4	Journal		10	
			Total	**20**	**20**	

Rubrics:

DIY- Product Development:

Students have to make DIY Product in Lab by using different compounds. (eg - DIY Odor Removal Sachets (Activated Charcoal Pouches), Moisture Absorbing Packets (Silica Gel DIY), DIY Water Purification Unit (Charcoal + Sand + Gravel), Natural Air Freshener Gel etc. Students prepare report and upload on GMIU web portal.

Practical Experiments on Adsorption-

Students have to study adsorption process for different solutions on different surfaces. (eg- Adsorption of Acetic Acid on Activated Charcoal (Freundlich Isotherm), Adsorption of Colored Dye (e.g., Methylene Blue) on Activated Charcoal, Adsorption of Oxalic Acid on Charcoal etc.)

Exploring the role of catalysts in the Decomposition of Hydrogen Peroxide

Students will analyze how the surface area affects the rate of decomposition.

4

Catalysis:

- Catalyst, inhibitor, autocatalysis. Homogeneous and Heterogeneous catalysis. Applications of catalysts in industries, role of active sites in catalysis, characterization of catalysts, acid base catalysis.

Practical :

- Different types of practical which involve catalysis reactions

Evaluation Methods

Sr. No	Evaluation Methods	SEE	CCE
1	Hands-On Practical Tasks	10	
2	Executing a Reaction Setup	10	
3	**ALA:** Speak Up Session		10
4	Viva Voce		10
	Total	**20**	**20**

Rubrics:

T:P 6:12

20%

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<td>Hands-On Practical Tasks: Students can Perform Acid-Base reaction catalysis (Lemon Juice + Baking Soda Reaction), Role of Heat as a Catalyst (Compare Cold vs. Warm Reactions) etc.

Executing a Reaction Setup:Students will perform different Reaction catalysis in lab(Eg- Heterogeneous Catalysis, Homogeneous Catalysis, Autocatalysis, Acid-Base Catalysisetc).

ALA: Speak Up Session: Faculty will assign Topics while Students will explain in video/Reel. (Eg.Heterogeneous Catalysis in Industry, Biological Catalyst,Catalyst Poisoning etc) & student will upload it on GMIU Web portal.
Students must use charts, objects, or act—no pen, paper, or slides
Encourage use of props or demos (like showing yeast as enzyme catalyst).</td>
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<td>5</td>
<td>Colloids
▪ Definition, Classification of colloids, Solids in liquid (Sols). Preparation and Purification (Lyophobic). General colloids, optical and electrical properties, Stability of colloids .Liquid in liquid (Emulsion), Types of Emulsion, Emulsifiers, Preparation & use .Liquid in solid (Gels).Preparation and uses of colloids.

Practical :
Different types of practical which involve Colloid formation.
Evaluation Methods
<table>
<tr><th>Sr. No</th><th>Evaluation Methods</th><th>SEE</th><th>CCE</th></tr>
<tr><td>1</td><td>Tyndall Effect Model</td><td></td><td>10</td></tr>
<tr><td>2</td><td>Colloid Model Making</td><td>20</td><td></td></tr>
<tr><td>3</td><td>Reel Making of colloids</td><td></td><td>10</td></tr>
<tr><td></td><td>Total</td><td>20</td><td>20</td></tr>
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Rubrics-
Tyndall Effect Model-Students have to create real life based Tyndall Effect Model by their own.(Eg.Show beam of light passing through colloid- fog in a bottle, milk + laser torch).

Colloid Model Making- Students can make different colloid model by using Dispersed phase and Dispersion medium.</td>
<td>T:P
6:12</td>
<td>20%</td>
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Distribution of Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	--	30%	30%	30%	10%	--

Course Outcome:

After learning the course the students should be able to:	
CO1	Understand and explain the fundamental components of an atom—protons, neutrons, and electrons—including their respective charges and spatial locations in the atom.
CO2	Analyze molecular orbital electron configurations to determine bond order, predict bond length and bond strength, and assess the magnetic behavior of molecules and ions.
CO3	Evaluate the role of Surface area in chemical reactions, and outline the mechanisms involved.
CO4	Analyze how catalysts lower activation energy, facilitate faster chemical reactions, and remain unchanged after the reaction.
CO5	Identify surface and interfacial phenomena to interpret their effects on physical and chemical behavior of materials.

Instructional Method:

The course delivery method will depend upon the requirement of content and needs 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 ofthe 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] Comprehensive practical organic chemistry, V. K. Ahuwalia

[2] Text book of Physical Chemistry,- Glasstone; London Macmillan & Company Ltd.

[3] Vogel's Textbook of practical organic chemistry, 5th Edition by B. S. Furniss et. al.

[4] Basic Inorganic chemistry,-F.A.Cotton, G.Wilkinson; John Wiley & Sons

[5] Modern ABC chemistry, CBSE reference book

[6]Basic chemistry, Karen C. Timberlake, W.Timberlake