



Course Syllabus  
Gyanmanjari Science College  
Semester-2(B.Sc.)

**Subject:** Basic Inorganic Chemistry – BSCCM12304

**Type of course:** Major

**Prerequisite:** A basic understanding of atomic structure, including the concept of electron shells and orbitals and understanding of the periodic table and how it is organized

**Rationale:** Basic inorganic chemistry is the study of the synthesis, structure, and properties of inorganic compounds. It is a fundamental branch of chemistry that has applications in many different fields, including materials science, catalysis, and medicine.

**Teaching and Examination Scheme:**

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

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

3 Credits \* 25 Marks = 75 Marks (each credit carries 25 Marks) Theory  
1 Credits \* 25 Marks = 25 Marks (each credit carries 25 Marks) Practical  
SEE 100 Marks will be converted in to 50 Marks  
CCE 100 Marks will be converted in to 50 Marks  
It is compulsory to pass in each individual component.



## Course Content:

Unit No	Course content	Hrs	% Weightage
1	<p><b>Chapter-1: Chemical bonding :</b></p> <ul style="list-style-type: none"> <li>• Explanation of following chemical bonds :</li> <li>• Ionic bond : NaCl, KF, Li<sub>2</sub>O, CaO, Na<sub>2</sub>S, MgO, CaCl<sub>2</sub></li> <li>• Covalent bond : O<sub>2</sub>, N<sub>2</sub>, Cl<sub>2</sub>, CH<sub>4</sub>, CO<sub>2</sub>, NH<sub>3</sub>, CCl<sub>4</sub>, HCl, HF, H<sub>2</sub>O</li> <li>• Co-ordinate covalent bond : CO, NH<sub>4</sub><sup>+</sup>, SO<sub>2</sub>, SO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, SO<sub>2</sub>Cl<sub>2</sub></li> <li>• Hydrogen bond : HF, H<sub>2</sub>O, NH<sub>3</sub>, salicylic acid, CH<sub>3</sub>COOH</li> </ul> <p><b>Chapter-2:Hybridization:</b></p> <ul style="list-style-type: none"> <li>• Brief Introduction of hybridization,</li> <li>• Explanation of <i>sp</i>, <i>sp</i><sup>2</sup>, <i>sp</i><sup>3</sup>, <i>sp</i><sup>3</sup><i>d</i>, <i>sp</i><sup>3</sup><i>d</i><sup>2</sup> and <i>sp</i><sup>3</sup><i>d</i><sup>3</sup></li> <li>• Hybridization with the help of BeH<sub>2</sub>, BCl<sub>3</sub>, CH<sub>4</sub>, NH<sub>3</sub>, H<sub>2</sub>O, PCl<sub>5</sub>, SF<sub>6</sub> and IF<sub>7</sub></li> </ul>	15	25
2	<p><b>Chapter-3: Wave mechanics:</b></p> <ul style="list-style-type: none"> <li>• Introduction,</li> <li>• Matter waves,</li> <li>• The wave nature of the electron,</li> <li>• Wave equation,</li> <li>• De-Broglie equation and Heisenberg's uncertainty principle, fundamental postulates of wave mechanics,</li> <li>• Introduction of Schrodinger's wave equation,</li> <li>• Quantum numbers,</li> <li>• Numericals based on De- Broglie equation and Heisenberg's uncertainty principle.</li> </ul>	10	25



3	<p><b>Chapter-4: Physical properties of liquids:</b></p> <ul style="list-style-type: none"> <li>• Additive, colligative and constitutive properties.</li> <li>• Various physical properties such as Surface tension, Parachor, Viscosity, Refractive index , Dipole moment, Osmotic pressure, drop method for the determination of surface tension,</li> <li>• importance of dipole moment in determination of Molecular structure,</li> <li>• Molecular weight determination of macro molecules by osmotic pressure method,</li> <li>• Numerical based on surface tension, refractive index, dipole moment and osmotic pressure</li> </ul>	10	25
4	<p><b>Chapter-5: Transition elements</b></p> <ul style="list-style-type: none"> <li>• Brief account on transition elements and real transition elements.</li> <li>• Position of transition elements in periodic table,</li> <li>• electronic configuration of first transition series (Sc to Zn),</li> <li>• explanation for physical properties such as density, atomic radii, melting point and boiling point, conductance of heat and electronic configuration,</li> <li>• explanation based on chemical and physical properties such as :</li> <li>• Decrease in basicity and increase in acidity</li> <li>• Ionization potential</li> <li>• Valency and variable valency</li> <li>• Catalytic property</li> <li>• Complex formation</li> <li>• Interstitial compounds</li> <li>• Stoichiometric and non-stoichiometric compounds</li> <li>• Color Magnetic properties based on their electronic configuration.</li> <li>• Explanation of alloy formation and Hume-Rothery rule. Zero complex compound among transition elements.</li> </ul>	10	25





**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1	<b>Post Visit Reflections</b> After the visit, ask students to write reflective essays or reports about what they learned. Encourage them to relate the industrial processes to their theoretical knowledge and identify any gaps in their understanding and then upload it on GMIU web Portal.	10
2	<b>Model Making</b> Faculty will assign scientific structures and students will analyze and prepare a model of structure and upload photo on GMIU web Portal.	10
3	<b>Chemical Analysis</b> Faculty will assign list of liquid and students will analyze and prepare a detailed description in 250 words and upload it to GMIU web Portal.	10
4	<b>Table Creation</b> Faculty will assign list of transition metals and students will analyze and prepare a table about given data and upload the table on GMIU web Portal.	10
5	<b>Attendance</b>	10
<b>Total</b>		<b>50</b>

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

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	25%	30%	45%	-	-	-

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:**

After learning the course the students should be able to:	
CO1	Pertain the basic concepts of bonding & hybridization.
CO2	Understand wave nature by different theories like De-Broglie's equation and Schrodinger's wave equation & it's application.
CO3	Acquire the basic concept of periodic table & transition element.
CO4	Apply various physical properties of liquid phase.

**List of Practicals:**

Sr. No	Descriptions	Unit No	Hrs
1	Inorganic Qualitative Analysis; <b>Inorganic Qualitative analysis of compounds having two radicals.</b> Positive radicals: $\text{Cu}^{+2}$ , $\text{Sb}^{+2}$ , $\text{Cd}^{+2}$ , $\text{As}^{+3}$ , $\text{Al}^{+3}$ , $\text{Fe}^{+3}$ , $\text{Fe}^{+2}$ , $\text{Zn}^{+2}$ , $\text{Mn}^{+2}$ , $\text{Ni}^{+2}$ , $\text{Co}^{+2}$ , $\text{Ca}^{+2}$ , $\text{Ba}^{+2}$ , $\text{Sr}^{+2}$ , $\text{Mg}^{+2}$ , $\text{Na}^{+}$ , $\text{K}^{+}$ , $\text{NH}_4^{+}$  Negative radicals : $\text{CO}_3^{-2}$ , $\text{O}^{-2}$ , $\text{Cl}^{-1}$ , $\text{Br}^{-1}$ , $\text{I}^{-1}$ , $\text{PO}_4^{-3}$ , $\text{S}^{-2}$ , $\text{SO}_3^{-2}$ , $\text{NO}_2^{-1}$ , $\text{NO}_3^{-1}$ , $\text{CrO}_4^{-2}$ , $\text{Cr}_2\text{O}_7^{-2}$ , $\text{SO}_4^{-2}$ (Maxi. 15)	All	30
<b>Total</b>			<b>30</b>

**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) Basic Inorganic chemistry, - *F.A.Cotton, G.Wilkinson*; John Wiley & Sons
- 2) Quantum chemistry, - *Iran.N.Levine* ; P H I Learning Private Ltd.
- 3) Modern Inorganic chemistry, - *G.D.Parkes*; Longmans, Green & Co. London
- 4) Vogel qualitative Inorganic Analysis by G. Svehla. universities press.
- 5) Text book of Physical Chemistry, - *Glasstone*; London Macmillan & Company Ltd.

