

DEPARTMENT OF SCIENCES / MILLI AL-AMEEN COLLEGE (For girls)

UG (GENERAL)-CBCS CURRICULUM (2019-2023)

(UNDER THE UNIVERSITY OF CALCUTTA)

**Programme Outcomes (PO):**

- ❖ **PO1. Critical Thinking:** The curriculum is aimed to inculcate problem solving ability, scientific thinking and knowledge of students. Students are expected to achieve critical thinking ability to design, carry out, record and analyse the results of different scientific experiments.
- ❖ **PO2. Effective Communication:** The medium of instruction for this course is English. English being used in many countries; students develop habit to communicate in English using language and terminology used in bio- sciences.
- ❖ **PO3. Social Awareness:** As an inhabitant of this green world, we must make our planet clean and suitable for living to all. Students are expected to be more aware of finding scientific solutions for sustainable development of this planet. They are expected to maintain good laboratory practices and safety.
- ❖ **PO4. Ethics:** In this programme, students are made sensible regarding the misuse of chemicals and resources.
- ❖ **PO5. Laboratory Skill and Instrumentation:** The curriculum is aimed to inculcate students' theoretical knowledge of instruments, chemical reactions and their analytical applications in diverse fields such as academia, research or industrial applications.
- ❖ **PO6. Environment and sustainability:** Students become very familiar with various pollutants and their impact on eco-system which makes them sensible for protection and conservation of environment.

**Course Outcomes (CO):**

<b>YEAR</b>	<b>PAPER</b>	<b>COURSE</b>	<b>OUTCOMES</b>
<b>SEM-1</b>	<b>CEM-G-CC1-TH</b>	<b>CO1</b>	<ul style="list-style-type: none"> <li>▪ To know in detail about Kinetic Theory of Gases; Liquids and Chemical kinetics.</li> <li>▪ To learn the basic concept, terms and equations of Atomic Structure; Chemical Periodicity and Acids and Bases.</li> <li>▪ To learn about the Fundamentals of Organic Chemistry, stereo chemistry</li> </ul>
	<b>CEM-G-CC1-P</b>	<b>CO2</b>	<ul style="list-style-type: none"> <li>▪ To learn practically how to do the quantitative estimation of ions in a solution by using iodometric titration, permanganate titration and dichromate titration.</li> <li>▪ To learn how to estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture and how to estimate of water of crystallization in Mohr's salt by titrating with <math>\text{KMnO}_4</math>.</li> <li>▪ To study the estimation of oxalic acid by titrating it with <math>\text{KMnO}_4</math>.</li> </ul>
	<b>ZOOG-CC-1 1-TH</b>	<b>CO3</b>	<ul style="list-style-type: none"> <li>▪ Understanding the classification of animal world along with external and internal characteristics.</li> <li>▪ Understanding the general features of different vertebrates.</li> </ul>
	<b>ZOOG-CC1 1-P</b>	<b>CO4</b>	<ul style="list-style-type: none"> <li>▪ Identification of different biological specimens</li> <li>▪ Identification of poisonous and non- poisonous snakes</li> <li>▪ Understanding the internal anatomy of live specimen.a</li> </ul>

<b>SEM-1</b>	<b>BOT-G-CC1-1-TH</b>	<b>CO5</b>	<ul style="list-style-type: none"> <li>▪ To understand detail about different plant groups</li> <li>▪ Understanding plant pathology, and plant anatomy</li> </ul>
	<b>BOT-G-CC1-1-P</b>	<b>CO6</b>	<ul style="list-style-type: none"> <li>▪ Preparation of algal and fungal specimens</li> <li>▪ Anatomical study of different plant parts</li> <li>▪ Identification of cryptogamic and pathological specimens.</li> <li>▪ Laboratory records, Local excursion and related field report.</li> </ul>
<b>SEM-2</b>	<b>CEM-G-CC2-TH</b>	<b>CO7</b>	<ul style="list-style-type: none"> <li>▪ To understand detail about Chemical thermodynamics, Chemical equilibrium, Solutions, Phase Equilibrium and Solids.</li> <li>▪ To learn about synthesis, properties and reactions of Aliphatic Hydrocarbons.</li> <li>▪ To understand about Error analysis and Computer Applications.</li> <li>▪ To know the basic knowledge, types and applications Redox Reactions</li> </ul>
	<b>CEM-G-CC2-P</b>	<b>CO8</b>	<ul style="list-style-type: none"> <li>▪ To study the kinetics of acid-catalyzed hydrolysis of methyl acetate and decomposition of H<sub>2</sub>O<sub>2</sub> (Clock Reaction).</li> <li>▪ To determine the viscosity of unknown liquid (glycerol, sugar) with respect to water, surface tension of a liquid using Stalagmometer and the solubility of sparingly soluble salt in water.</li> <li>▪ Preparation of buffer solutions and finding the pH of an unknown buffer solution by colour matching method.</li> </ul>

<b>SEM-2</b>	<b>ZOOG-CC2-2-TH</b>	<b>CO9</b>	<ul style="list-style-type: none"> <li>▪ To learn about comparative anatomy of different organ systems in vertebrates.</li> <li>▪ Early embryonic development in invertebrate model</li> <li>▪ Late embryonic development in vertebrate model</li> </ul>
	<b>ZOOG-CC2-2-P</b>	<b>CO10</b>	<ul style="list-style-type: none"> <li>▪ Identification of different bones</li> <li>▪ Identification of larval stages</li> <li>▪ Identification of developmental stages and placenta.</li> </ul>
	<b>BOTG-CC2-2-TH</b>	<b>CO11</b>	<ul style="list-style-type: none"> <li>• Study of pteridophytes and gymnosperms</li> <li>• Concepts of Paleobotany and palynology</li> <li>• Morphology and taxonomy of angiosperms</li> </ul>
	<b>BOTG-CC2-2-P</b>	<b>CO12</b>	<ul style="list-style-type: none"> <li>• Dissection and study of angiospermic plant parts.</li> <li>• Identification of anatomical slides and plant specimens</li> <li>• Spot identification of angiospermic plants through local excursion and preparation of herbarium sheets.</li> </ul>
<b>SEM-3</b>	<b>CEM-G-CC3-TH</b>	<b>CO13</b>	<ul style="list-style-type: none"> <li>▪ To learn about Chemical bonding and Molecular structure, Comparative study of p-block elements, Transition Elements and Co-ordination Chemistry.</li> <li>▪ To know the basic concept, terms, equations and applications of Electrochemistry.</li> <li>▪ To understand about the synthesis, properties, chemical reactions and mechanism of Aromatic Hydrocarbons, Aryl halides.</li> </ul>

<b>SEM-3</b>	<b>CEM-G-CC3-P</b>	<b>CO14</b>	<ul style="list-style-type: none"> <li>▪ To study experimentally the qualitative detection of known and unknown radicals in a mixture.</li> </ul>
	<b>ZOOG-CC3-3-TH</b>	<b>CO15</b>	<ul style="list-style-type: none"> <li>▪ Study of human physiology and associated physiological processes.</li> <li>▪ Study of different biochemical pathways involved in metabolism in human.</li> </ul>
	<b>ZOOG-CC3-3-P</b>	<b>CO16</b>	<ul style="list-style-type: none"> <li>▪ To identify histological slides of different tissues</li> <li>▪ Qualitative analysis of biochemical samples.</li> </ul>
	<b>ZOOG-SEC-A-3-1-TH</b>	<b>CO17</b>	<ul style="list-style-type: none"> <li>▪ Concepts of apiculture, diseases in bees and apiculture entrepreneurship.</li> </ul>
	<b>BOTG-CC3-3-TH</b>	<b>CO18</b>	<ul style="list-style-type: none"> <li>• Concepts of cell biology</li> <li>• Concepts of genetics</li> <li>• Concepts of bacterial biology and virology</li> </ul>
	<b>BOTG-CC3-3-P</b>	<b>CO19</b>	<ul style="list-style-type: none"> <li>• Cell biology – Work out of mitotic and meiotic stages and identification of same through permanent slides.</li> <li>• Microbiology- study of bacteria and viruses and identification of different forms of bacteria through permanent slides.</li> </ul>
	<b>SEM-4</b>	<b>CEM-G-CC4-TH</b>	<b>CO20</b>

	<b>CEM-G-CC4-P</b>	<b>CO21</b>	<ul style="list-style-type: none"> <li>▪ To learn experimentally the qualitative analysis of single known and unknown solid organic compounds and also the identification of pure solid and liquid organic compounds.</li> </ul>
	<b>ZOOG-CC4-4-TH</b>	<b>CO22</b>	<ul style="list-style-type: none"> <li>▪ To understand Mendelian genetics and it's extensions.</li> <li>▪ Understanding mutation, linkage and crossing over and sex determination</li> <li>▪ Understanding fundamentals of evolution by the concept of origin of life, evolutionary theories and speciation concept.</li> </ul>
	<b>ZOOG-CC4-4-P</b>	<b>CO23</b>	<ul style="list-style-type: none"> <li>▪ Verification of Mendelian ratio by biostatistical tool.</li> <li>▪ Identification of chromosomal disorder by karyotype picture.</li> <li>▪ Study of horse phylogeny with the help of concerned diagrams</li> <li>▪ Identification of Darwin's Finches and their study from pictures</li> <li>▪ Museum visit.</li> </ul>
	<b>ZOOG-SEC-B-4-2-TH</b>	<b>CO24</b>	<ul style="list-style-type: none"> <li>▪ Concepts of aquarium fishkeeping, aquarium fishes biology and their transportation and aquarium maintenance.</li> </ul>
	<b>BOTG-CC4-4-TH</b>	<b>CO25</b>	<ul style="list-style-type: none"> <li>▪ Understanding of Plant physiology and metabolism</li> </ul>

	<b>BOTG-CC4-4-P</b>	<b>CO26</b>	<ul style="list-style-type: none"> <li>▪ Understanding of plant physiology – plasmolysis, deterioration of transpiration rate, imbibition of water by proteinaceous and fatty seeds.</li> <li>▪ Evolution of oxygen during photosynthesis and evolution of CO<sub>2</sub> during respiration.</li> </ul>
<b>SEM-5</b>	<b>DSE-A-2-TH (INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE)</b>	<b>CO27</b>	<ul style="list-style-type: none"> <li>▪ To learn about composition and properties of some industrially important compounds, Glass, Cements, Ceramics, Fertilizers, Alloys, Batteries, Dyes, Pigments, surface coatings and some chemically explosive compounds.</li> </ul>
	<b>DSE-A-2-P (INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE) (Practicals)</b>	<b>CO28</b>	<ul style="list-style-type: none"> <li>▪ To learn estimation of free acidity and essential elements (Ca, P) in some common fertilizers.</li> <li>▪ To analyse (Cu, Ni); (Cu,Zn) in synthetic samples or alloy and cement.</li> <li>▪ To know in detail electroless metallic coating on cement and plastic material and preparation of pigment (ZnO).</li> </ul>
	<b>BOTG-DSE-A--1- TH (BOTTDSEG XVI)</b>	<b>CO29</b>	<ul style="list-style-type: none"> <li>• Understanding of Phytochemistry and medicinal botany that includes concepts of Ethnobotany and folk medicine</li> <li>▪ Pharmacognosy, organoleptic evaluation of crude drugs.</li> <li>▪ Primary and secondary metabolites.</li> </ul>
	<b>BOTG-DSE-A--1- P (BOTPDSEG - XVII)</b>	<b>CO30</b>	<ul style="list-style-type: none"> <li>▪ Preparation of buffers and solutions.</li> <li>▪ Study of various laboratory instruments like- analytical balance, water bath etc.</li> <li>▪ Qualitative analysis of biochemical compounds.</li> <li>▪ Analytical tests for tannin and alkaloids.</li> <li>▪ Identification of medicinal plants through local field study.</li> </ul>

	<p><b>ZOOG-DSE-A-5-1-TH</b></p>	<p><b>CO31</b></p>	<ul style="list-style-type: none"> <li>▪ To learn about biological importance of host parasite reaction.</li> <li>▪ Understanding epidemiology.</li> <li>▪ Knowledge about parasitic protozoans, helminths,</li> <li>▪ Medicinally and economically important insects.</li> <li>▪ Commercial zoology including animal husbandry, poultry farming and fish technology.</li> </ul>
	<p><b>ZOOG-DSE-A-5-1-P</b></p>	<p><b>CO32</b></p>	<ul style="list-style-type: none"> <li>▪ Identification of parasitic protozoans, helminths, and their life stages.</li> <li>▪ Study of arthropod vectors and associated human diseases.</li> <li>▪ Study of pest caused damage to plant parts or stored grains through photographs and damaged products.</li> <li>▪ Identification and studying economic importance of some pests.</li> <li>▪ Poultry farm visit and aquarium maintenance.</li> </ul>
	<p><b>SEC-1 BOTTSECG-IX</b></p>	<p><b>CO33</b></p>	<ul style="list-style-type: none"> <li>▪ Concepts of Applied botany- Understanding Plant breeding and biometry.</li> <li>▪ Mass and pure line selection process, Heterosis and hybrid seed production.</li> <li>▪ Application of. mutation, polyploidy ,hybridisation technique in crop improvement related to biotechnology.</li> <li>▪ Biostatistical tools – chi square and goodness to fit related to agricultural practice.</li> </ul>



<b>SEM-6</b>	<b>DSE-B1: GREEN CHEMISTRY AND CHEMISTRY OF NATURAL PRODUCTS</b>	<b>CO34</b>	<ul style="list-style-type: none"> <li>▪ To learn about principles of Green Chemistry and Designing a Chemical synthesis utilizing the principles.</li> <li>▪ To get an idea about green solvents, green catalytic reagents, green chemistry and catalysis.</li> <li>▪ To know about future trends in green chemistry and natural products (Alkaloids and terpenes).</li> </ul>
	<b>PRACTICALS-DSE-B1 (LAB GREEN CHEMISTRY)</b>	<b>CO35</b>	<ul style="list-style-type: none"> <li>▪ To study To learn about principles of Green Chemistry and Designing a Chemical synthesis utilizing the principles.</li> <li>▪ To get an idea about green solvents, green catalytic reagents, green chemistry and catalysis.</li> <li>▪ To know about future trends in green chemistry and natural products (Alkaloids and terpenes).</li> </ul>
	<b>SEC 4 - PESTICIDE CHEMISTRY</b>	<b>CO36</b>	<ul style="list-style-type: none"> <li>▪ To learn about pesticides (natural and synthetic), their benefits, adverse effects, and structure activity relationship.</li> <li>▪ To know about synthesis and technical manufacture and uses of different pesticides such as Organochlorines (DDT, Gammexene), Organophosphates (Malathion, Parathion), Carbamates (Carbofuran, carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor).</li> </ul>
	<b>DSE-B2: BOTTDSEG-XVIII</b>	<b>CO37</b>	<ul style="list-style-type: none"> <li>▪ Comprehensive knowledge of Horticultural practice and post-harvest technology- identification of fruits and</li> </ul>

			vegetable plants, disease control and management of post-harvest diseases of common crop fields.
	<b>DSE-B2 (Pr): BOTPDSEG-XIX</b>	<b>CO38</b>	<ul style="list-style-type: none"> <li>▪ Field trips to different horticultural gardens, cold storage and standing cropfields etc.</li> </ul>
	<b>SEC5: BOTTSECGXIII</b>	<b>CO39</b>	<ul style="list-style-type: none"> <li>▪ Understanding mushroom culture technology</li> <li>▪ Study of various types of mushroom, their nutritional and medicinal values, Cultivation process, storage technique, food preparation and research centers (national and regional) of India.</li> </ul>
	<b>ZOOG-DSE-B-6- 2-TH</b>	<b>CO40</b>	<ul style="list-style-type: none"> <li>• Understanding the fundamentals of ecology, population ecology, community ecology, ecosystem</li> <li>• Understanding the importance of wildlife conservation and practical approach towards wildlife conservation.</li> </ul>
	<b>ZOOG-DSE-B-6- 2-P</b>	<b>CO41</b>	<ul style="list-style-type: none"> <li>• Identification of some significant plants, mammals and birds.</li> <li>• Concept about basic equipment required for wildlife studies.</li> <li>• Field study for understanding animal evidences like pug marks, hoof marks, scats etc.</li> <li>• Understanding aquatic ecosystem by field study of zooplankton and phytoplankton and measuring different water parameters.</li> </ul>

### CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓					
CO2					✓	
CO3	✓					
CO4					✓	
CO5	✓					
CO6					✓	
CO7	✓					

CO8					✓	
CO9	✓					
CO10					✓	
CO11	✓					
CO12					✓	
CO13	✓					
CO14					✓	
CO15	✓					
CO16					✓	
CO17			✓	✓		
CO18	✓					
CO19					✓	
CO20	✓					✓
CO21					✓	✓
CO22	✓					
CO23		✓			✓	
CO24	✓		✓	✓		
CO25	✓					
CO26					✓	
CO27	✓					✓
CO28					✓	✓
CO29	✓			✓		
CO30					✓	✓
CO31	✓		✓			
CO32					✓	
CO33	✓				✓	
CO34	✓			✓		
CO35					✓	
CO36				✓		✓
CO37	✓		✓			
CO38		✓			✓	
CO39			✓	✓	✓	
CO40	✓		✓			✓
CO41					✓	✓