**Course Plan (Physical Inorganic & Analytical Chemistry Practical)**

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| **Course Title: Physical Inorganic & Analytical Chemistry Practical** |

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| **Course Code:** NFE 116 | **Course Code:** NFE 116 | **Course Code:** NFE 116 |
| **Rationale:** This course is designed to provide practical knowledge of Physical Inorganic and Analytical chemistry and allied subjects. This course covers qualitative analysis of the inorganic compounds and quantitative (enthalpy and titrimetric) analysis so that students will be able to determine composition of inorganic compounds individually and to learn to do titrimetric analysis (acid- base, redox) and enthalpy change of reaction by themselves. |

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| **Objectives:** The specific objectives of the course are:* to develop necessary skills on analyzing cations and anions present in inorganic compounds.
* to grow indispensable understanding in different titrimetric analysis.
* to provide essential knowledge on how to design, carry out, record and analyse the results of chemical experiments.
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| **Outcome:** The knowledge and concepts of Physical, Inorganic and Analytical Chemistry are actively used to reinforce the previous learning. Such practical activities promote students’ readiness for their future career as laboratory experts. The approach of this course is also to link all written laboratory activities with illustrations to facilitate well understanding of the practical laboratory steps. |

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| **Week** | **Learning platform** | **Topic** | **Learning outcomes/benefits** |
| 1 | Online discussion, watching videos | 1. Discussion about necessary human qualities and honesty of the students.
2. Importance of **Physical Inorganic & Analytical Chemistry** in Food and Nutrition Engineering
 | Students can understand the Engineering Ethics as well as the importance of this course |
| 2 | Online discussion, watching videos and practicing reactions on digital board | Principals, methods and necessary reactions of identification-1. Group I & II metal cations by flame test.
 | Practical experience of identification of cations and anions in the laboratory will increase students' confidence and skills and enable them to develop themselves as laboratory experts for their respective field of work . |
| 3 | Online discussion, watching videos and practicing reactions on digital board | Principals, methods and reactions of identification- 1. Cations (Fe²⁺, Fe3⁺, Cu²⁺, Cr3⁺, Ca²⁺, Pb²⁺, Zn²⁺, Al3⁺, NH4+ )
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| 4 | Online discussion, watching videos and practicing reactions on digital board | Principals, methods and reactions of identification- 1. Anions (Cl⁻, Br⁻, I⁻, CO32⁻, HCO3⁻, NO3⁻, SO4²⁻ & SO3²⁻)
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| **Week** | **Learning platform** | **Name of the Experiment** | **Learning outcomes/benefits** |  |
| 5 | Laboratory | **Laboratory Module A:** Qualitative Analysis 1. Identification of Group-1 & Group-2 metal ions by Flame Test.
 | Practical experience of identification of cations and anions in the laboratory will increase students' confidence and skills and enable them to develop themselves as laboratory experts for their respective field of work . |
| 6 | Laboratory | 1. Identification of other cations with NaOH, & NH4OH solutions (Fe²⁺, Fe3⁺, Cu²⁺, Cr3⁺, Ca²⁺, Pb²⁺, Zn²⁺, Al3⁺, NH4+).
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| 7 | Laboratory | 1. Identification of Anions (Cl⁻, Br⁻, I⁻, CO32⁻, HCO3⁻, NO3⁻, SO4²⁻ & SO3²⁻)
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| 8 | Laboratory |  Mid-Term Examination  |  |
| 9 | Laboratory |  **Laboratory Module B:** Quantitative Analysis (Titrimetric Analysis)1. Standardization of NaOH solution with standard oxalic acid solution.
2. Standardization of HCl solution with standard NaOH solution.
3. Standardization of Sodium thiosulphate solution with standard Potassium dichromate solution.
4. Estimation of Copper contained in a supplied solution by Iodometric method.
 | Students will be able to prepare any kind of standard solution and can calculate the unknown concentration of solution by titrimetric method. |
| 10 | Laboratory | 1. Quantitative exercise to find the molar enthalpy change when Ammonium chloride dissolves in water.
2. Quantitative exercise to find the molar enthalpy change when Sodium thiosulphate dissolves in water
 | Students will be able to calculate the enthalpy change of any exothermic or endothermic reaction. |
| 11 | Laboratory |  Final Examination |  |