

| Department of Chemistry  |                   |  |                     |   |                   |  |
|--|-------------------|--|---------------------|---|-------------------|--|
| Academic Calender and Academic Plan                              |                   |  |                     |   |                   |  |
| 1st Semester General Course (July 2018 - Dec 2018) CC / GE / GEH |                   |  |                     |   |                   |  |
| Name of the paper  | Module or Unit No | Topic  | Name of the teacher | To be Completed during the month and year | No of PPT classes | Continuous Internal Assesment in which month |
| CC / GE /GEH   | I                 | Atomic Structure<br>Chemical Periodicity<br>Acids and Bases  | KB                  | YES                                       | 0                 | AUG,SEP,NOV                                  |
| CC / GE /GEH   | II                | Electronic displacements:<br>Stereochemistry   | KT                  | YES                                       | 0                 | AUG,SEP,NOV                                  |
| CC / GE /GEH   | III               | Kinetic Theory of Gases and Real gases ,<br>Liquids  | SB                  | YES                                       | 0                 | AUG,SEP,NOV                                  |
| CC / GE /GEH   | IV                | Chemical Kinetics<br>Nucleophilic Substitution and Elimination Reactions   | SC                  | YES                                       | 0                 | AUG,SEP,NOV                                  |
| CC / GE /GEH   | V                 | PRACTICAL CHEMISTRY<br>Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.<br>Estimation of oxalic acid by titrating it with KMnO <sub>4</sub> .<br>Estimation of water of crystallization in Mohr's salt by titrating with KMnO <sub>4</sub> .<br>Estimation of Fe (II) ions by titrating it with K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> using internal indicator.<br>Estimation of Cu (II) ions iodometrically using Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> .<br>Estimation of Fe(II) and Fe(III) in a given mixture using K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> solution | KB & KT             | YES                                       | 0                 |  |

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| <b>Course Outcome</b> | <p>Students will be able to</p> <ul style="list-style-type: none"> <li>• To understand kinetic theory of gases</li> <li>• To get an introduction to the basic concepts of pressure, temperature and velocity of ideal gases.</li> <li>• To explain the key concepts of degree of freedom, equipartition of energy and specific heat</li> <li>• To get a concept of collision among molecules and with the wall</li> <li>• To understand deviation of real gas from ideal behavior.</li> <li>• To understand critical constant and vanderwall's constant.</li> <li>• To be able to derive rate equations from mechanistic data</li> <li>• To make use of simple models for predictive understanding of physical phenomena associated to kinetics</li> <li>• To study the dependence of the rate of chemical reactions on properties like pressure, temperature, presence of catalyst</li> <li>• To explain various theories and models relating to structure of atoms and their merits and demerits</li> <li>• To explain various electrochemical properties of elements in the periodic table vis-à-vis electronic configuration .</li> <li>• To discuss various theories pertaining to definition and classification of acids and bases</li> </ul> |
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**2nd Semester General Course (Jan 2019 - June 2019) CC / GE / GEH**

| Name of the paper | Module or Unit No | Topic  | Name of the teacher | To be Completed during the month and year | No of PPT classes | Continuous Internal Assesment in which month |
|-------------------|-------------------|--|---------------------|---|-------------------|--|
| CC / GE /GEH      | I                 | REDOX REACTION   | KB                  | YES                                       | 0                 | FEB,MAR,APRIL<br>MAY                         |
| CC / GE /GEH      | II                | ALIPHATIC HYDROCARBON  | KT                  | YES                                       | 0                 | FEB,MAR, APRIL<br>MAY                        |
| CC / GE /GEH      | III               | CHEMICAL EQUILIBRIUM<br>SOLUTIONS<br>EQUILIBRIA<br><br>PHASE<br>SOLIDS | SB                  | YES                                       | 0                 | FEB,MAR, APRIL<br>MAY                        |
| CC / GE /GEH      | IV                | CHEMICAL THERMODYNAMICS  | SC                  | YES                                       | 0                 | FEB,MAR, APRIL<br>MAY                        |

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| CC / GE /GEH | <p>PRACTICAL CHEMISTRY</p> <p>Study of kinetics of acid-catalyzed hydrolysis of methyl acetate</p> <p>Study of kinetics of decomposition of H<sub>2</sub>O<sub>2</sub> (Clock Reaction )</p> <p>Study of viscosity of unknown liquid (glycerol, sugar) with respect to water.</p> <p>Determination of solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator)</p> <p>Preparation of buffer solutions and find the pH of an unknown buffer solution by colour matching method</p> | SC/SB | YES |  |  |
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| <b>Course Outcome</b>   | <ul style="list-style-type: none"> <li>• To understand the principle of conservation of energy and how this principle can be used to assess the energy changes that accompany physical and chemical processes.</li> <li>• To examine the means by which a system can exchange energy with its surroundings in terms of the work it may do or the heat it may produce.</li> <li>• To understand the thermodynamic description of mixtures state function, exact, inexact differential</li> <li>• To understand the statements of 1st and 2nd laws of thermodynamics.</li> <li>• To learn the thermodynamic aspects of various processes and reactions.</li> <li>• To understand the concept of thermochemistry enthalpy change of different processes</li> <li>• To get the concept of Entropy (S) from Carnot cycle and the significance of Helmholtz free energy(A) &amp; Gibb's free energy (G)</li> <li>• To explain the criteria of spontaneity in terms of S,H and G.</li> <li>• To be able to derive important thermodynamic relations</li> <li>• To learn the basic concept of equilibrium</li> <li>• To understand Raoult's law</li> <li>• To compare Henry's law and Raoult's law to explain ideal solutions</li> <li>• To describe ideal liquid mixtures.</li> <li>• To explain non-ideal liquid-vapour systems.</li> <li>• To state and explain azeotropic mixtures.</li> <li>• To explain partially miscible and immiscible liquid systems by taking appropriate examples.</li> <li>• To describe how a solute distribute itself in two immiscible liquids,</li> <li>• To state and explain Nernst's distribution law,</li> <br/> <li>• To apply and derive an expression for modified Nernst distribution law for a special case in which solute associate or dissociate in one of the solvent ,</li> <li>• To classify systems as heterogeneous and homogeneous systems</li> <li>• To define equilibrium and metastable equilibrium</li> <li>• To appreciate the importance of phase rule equation in dealing with heterogeneous</li> <li>• General Preparation of different alkanes, alkenes and alkynes with mechanism</li> <li>• Some important Chemical reactions of alkanes, alkenes and alkynes with mechanism</li> <li>• Addition of an unsymmetrical addendum to an unsymmetrical substrate by applying Markonikoff's rule</li> <li>• Acidity of protons of acetylene</li> <li>• To explain the concept of redox reactions on th basis of redox potentials.</li> <li>• to discuss the feasibility of redox titration, redox indicators, redox potential at the equivalence point</li> <br/> <li>• To explain the concept of redox reactions on th basis of redox potentials.</li> </ul> |
| <b>3rd Semester General Course (July 2019 - Dec 2019) CC / GE / GEH</b> |   |

| Name of the paper | Module or Unit No | Topic   | Name of the teacher | To be Completed during the month and year | No of PPT classes | Continuous Internal Assessment in which month |
|-------------------|-------------------|---|---------------------|---|-------------------|---|
| CC / GE /GEH      | I                 | Chemical Bonding and Molecular Structure<br>Comparative study of p-block elements.<br>Transition elements (3d series)   | KB                  | YES                                       | 2                 | SEP,OCT,NOV                                   |
| CC / GE /GEH      | II                | Aromatic Hydrocarbons<br>Aryl Halides   | KT                  | YES                                       | 1                 | SEP,OCT,NOV                                   |
| CC / GE /GEH      | III               | Conductance   | AK                  | YES                                       | 1                 | SEP,OCT,NOV                                   |
| CC / GE /GEH      | IV                | Ionic Equilibria<br>Electromotive force   | KR                  | YES                                       | 1                 | SEP,OCT,NOV                                   |
| CC / GE /GEH      | V                 | Organometallic Compounds<br>Coordination Chemistry  | SC                  | YES                                       | 0                 | SEP,OCT,NOV                                   |
|                   |                   | PRACTICAL CHEMISTRY<br>Qualitative semimicro analysis of mixtures containing two radicals.<br>Emphasis should be given to the understanding of the chemistry of different reactions.<br>Cation Radicals: Na <sup>+</sup> ,K <sup>+</sup> , Ca <sup>2+</sup> , Sr <sup>2+</sup> , Ba <sup>2+</sup> , Al <sup>3+</sup> , Cr <sup>3+</sup> , Mn <sup>2+</sup> /Mn <sup>4+</sup> , Fe <sup>3+</sup> , Co <sup>2+</sup> /Co <sup>3+</sup> , Ni <sup>2+</sup> , Cu <sup>2+</sup> , Zn <sup>2+</sup> , Pb <sup>2+</sup> , Sn <sup>2+</sup> /Sn <sup>4+</sup> , NH <sub>4</sub> <sup>+</sup> .<br>Anion Radicals: F <sup>-</sup> , Cl <sup>-</sup> , Br <sup>-</sup> , BrO <sub>3</sub> <sup>-</sup> , I <sup>-</sup> , IO <sub>3</sub> <sup>-</sup> , SCN <sup>-</sup> , S <sub>2</sub> <sup>-</sup> , SO <sub>4</sub> <sup>2-</sup> , NO <sub>3</sub> <sup>-</sup> , NO <sub>2</sub> <sup>-</sup> , PO <sub>4</sub> <sup>3-</sup> , AsO <sub>4</sub> <sup>3-</sup> ,BO <sub>3</sub> <sup>3-</sup> , CrO <sub>4</sub> <sup>2-</sup> / Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup> | KB                  | YES                                       | 0                 |   |

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| <b>Course Outcome</b> | <ul style="list-style-type: none"> <li>• To discuss about the structure of ionic compounds and Their important properties.</li> <li>• Able to calculate the theoretical values of lattice energy and also experimental value.</li> <li>• To discuss about covalent molecules, VSEPR theory. MO treatment of homonuclear and hetero nuclear molecules.</li> <li>• To explain the concept of electronic configuration of p block elements, their common oxidation states, inert pair effect, about their important compounds.</li> <li>• CO-1. To explain their knowledge relating electronic configuration, colour, magnetic properties, different oxidation states catalytic properties for Mn, Fe, Cu</li> <li>• To discuss Werner's coordination theory, valence bond theory, drawback of VBT, complexities in orbitals of some selected elements etc.</li> <li>To develop an understanding of electrochemistry and the methods used to study the response of an electrolyte through current of potential</li> <li>• To understand why standard reduction potentials are used and how they are determined.</li> <li>• To understand the relationship between chemical energy (Gibbs free energy change for a redox reaction) and electrical energy (electromotive force or cell potential) in an electrochemical cell.</li> <li>• To explain the various terms such as specific conductance, equivalent conductance and molar conductance.</li> <li>• To Explain the effect of dilution on specific conductance, equivalent conductance and molar conductance</li> <li>• To understand the ionic mobility of different ions,</li> <li>• methods of determination of ionic mobility of ions</li> <li>• To understand Kohlrausch's law and its applications</li> <li>• To understand the basic concepts of Arrhenius theory of electrolytic dissociation, evidences in support of Arrhenius theory of electrolytic dissociation and its limitation,</li> <li>• To understand Ostwald's dilution law and its application in determination of Dissociation constant of weak electrolyt</li> </ul> |
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**3rd Semester General Course (July 2019 - Dec 2019) SEC**

| Name of the paper | Module or Unit No | Topic         | Name of the teacher | To be Completed during the month and year | No of PPT classes | Continuous Internal Assessment in which month |
|-------------------|-------------------|---------------|---------------------|---|-------------------|---|
| SEC               |                   | Carbohydrates | SC                  | YES                                       | 0                 | SEP,OCT,NOV                                   |
| SEC               |                   | Proteins      | SC                  | YES                                       | 0                 | SEP,OCT,NOV                                   |
| SEC               |                   | Enzymes       | SC                  | YES                                       | 0                 | SEP,OCT,NOV                                   |
| SEC               |                   | Lipids        | SC                  | YES                                       | 0                 | SEP,OCT,NOV                                   |
| SEC               |                   | Lipoproteins  | SC                  | YES                                       | 0                 | SEP,OCT,NOV                                   |

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| <b>SEC</b>   |  | Biochemistry of disease<br>Blood<br>Urine   | SC                         | YES  | 0                        | SEP,OCT,NOV  |
| <b>Course Outcome</b>  | <p>Explain the structure carbohydrates and amino acids, their physical and chemical properties and their function in living organisms.<br/>Describe the function of enzyme as a catalyst in maximum biological reaction and learn about the function of enzyme, and also see how they are related to things they come across in daily life.<br/>Understand the effect of cholesterol and triglycerides in human body<br/>Know about steroid hormone which regulates carbohydrate metabolism and has an anti-inflammatory effect on the body. It helps maintain blood pressure and regulate the salt and water balance in our body.<br/>. understand some of the types of disease that might be treatable by gene therapy</p> |   |                            |  |                          |  |
| <b>4th Semester General Course (Jan 2020 - Jun 2020) CC / GE / GEH</b> |  |   |                            |  |                          |  |
| <b>Name of the paper</b>   | <b>Module or Unit No</b>   | <b>Topic</b>  | <b>Name of the teacher</b> | <b>To be Completed during the month and year</b> | <b>No of PPT classes</b> | <b>Continuous Internal Assessment in which month</b> |
| CC / GE /GEH   |  | Alcohols, Phenols and Ethers<br>Amines and Diazonium Salts                                    | KR                         | NO   | 0                        | NO   |
| CC / GE /GEH   |  | Crystal Field theory<br>Quantum chemistry   | AK                         | NO   | 0                        | NO   |
| CC / GE /GEH   |  | Carbonyl Compounds<br>Carboxylic Acids and Their Derivatives<br>Amino Acids and Carbohydrates | SC                         | NO   | 0                        | NO   |

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|  | <p>PRACTICAL CHEMISTRY</p> <p>1. Qualitative Analysis of Single Solid Organic Compound(s)<br/> Experiment A: Detection of special elements (N, Cl, and S) in organic compounds. Experiment B: Solubility and Classification (solvents: H<sub>2</sub>O, dil. HCl, dil. NaOH)<br/> Experiment C: Detection of functional groups: Aromatic-NO<sub>2</sub>, Aromatic -NH<sub>2</sub>, -COOH, carbonyl (no distinction of -CHO and &gt;C=O needed), -OH (phenolic) in solid organic compounds.<br/> Experiments A - C with unknown (at least 6) solid samples containing not more than two of the above type of functional groups should be done.</p> <p>2. Identification of a pure organic compound<br/> Solid compounds: oxalic acid, tartaric acid, succinic acid, resorcinol, urea, glucose, benzoic acid and salicylic acid.<br/> Liquid Compounds: methyl alcohol, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde, chloroform and nitrobenzene.</p> |  |  |  |  |
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| <b>Course Outcome</b> | <ul style="list-style-type: none"> <li>• The structural differences of Alcohols: 1<sup>o</sup>-, 2<sup>o</sup>- and 3<sup>o</sup>- alcohols, Preparation, Identification of primary, secondary and tertiary alcohols, several reactions of alcohols with mechanism</li> <li>• The preparation of diols, Pinacol- pinacolone rearrangement (with mechanism) using diols</li> <li>• The various methods for preparing Phenols and their important reactions</li> <li>• Preparation of aromatic Ethers and their reactions</li> <li>• <b>o Carbonyl Compounds</b></li> <li>• The students will be learnt different types of Aliphatic and aromatic Carbonyl compounds both aldehydes and ketones by</li> <li>• Preparations of them by different methods both oxidative and reductive</li> <li>• Several types of reactions of them with mechanism</li> <li>• Reactivity differences between aldehyde and ketones</li> <li>• Different Condensation reactions of carbonyl compounds having <math>\alpha</math> H atoms</li> <li>• Some named reactions</li> <li>• <b>o Carboxylic Acids and Their Derivatives</b></li> <li>• The students will have a knowledge about</li> <li>• The structural differences and strengths of carboxylic acids : aliphatic and aromatic,</li> <li>• The Preparations of acids</li> <li>• several derivative of acids preparations</li> <li>• <b>o Amines and Diazonium Salts</b></li> <li>• The structural differences of Amines: 1<sup>o</sup>-, 2<sup>o</sup>- and 3<sup>o</sup>- amines, Preparation, Identification of primary, secondary and tertiary amines, several reactions of amines with mechanism</li> <li>• The preparation of diazonium salts from aromatic amines</li> <li>• The various methods for preparing different organic compounds by using benzene diazonium salts</li> <li>• <b>o Amino Acids and Carbohydrates</b></li> <li>• The students will be learnt different types of Amino acids and Carbohydrates by</li> <li>• Preparations of them by different methods</li> <li>• Several types of reactions of them with mechanism</li> <li>• zwitterion, isoelectric point in case of Amino acids</li> <li>• Different reactions of aldoses by ring size increasing and decreasing</li> <li>• Elementary idea about Mutarotation i.e, change in the specific rotation of aldohexoses with time</li> <li>• To express the concept of Crystal Field theory</li> </ul> |
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| 4th Semester General Course (Jan 2020 - Jun 2020) SEC |                   |       |                     |   |                   |   |
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| Name of the paper                                     | Module or Unit No | Topic | Name of the teacher | To be Completed during the month and year | No of PPT classes | Continuous Internal Assessment in which month |
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| <b>SEC</b>            | I  | Drugs & Pharmaceuticals | KT | NO | 0 | NO |
| <b>SEC</b>            | II   | Fermentation            | SC | NO | 0 | NO |
| <b>Course Outcome</b> | <ul style="list-style-type: none"> <li>• The drug designing</li> <li>• The synthesis of several drugs e.g., Analgesics Agents, Antipyretic Agents, Anti-inflammatory Agents, Antibiotics Agents, Antifungal Agents, Antiviral Agents, and HIV-AIDS related drugs by adopting the general established method. <ul style="list-style-type: none"> <li>o Aerobic and anaerobic fermentation</li> </ul> </li> <li>• Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.</li> </ul> |                         |    |    |   |    |