



Govt. of West Bengal  
Office of the Principal

# Government General Degree College, Nakashipara

## Department of Chemistry

Muragachha, Nadia, Pin – 741154

Phone No.: 03474-268008 web: <https://muragachhagovtcollege.in/> e-mail:  
chemistry.mgc15@gmail.com

Teaching Plan (Honours Course) of Odd Semesters for the Academic Session-

July 2022 - June 2023

Semester-I			
Course Code	Topics	Name of the Lecturer	No. of Lecture
CHEMHT-1	Extra nuclear Structure of atom	Dr. Sudipta Kr. Kundu	16L
	Periodic properties.		14L
	Kinetic Theory and Gaseous state	Mr. Rajib Mondal	18L
	Chemical Thermodynamics - I		12L
CHEMHP-1	<b>Inorganic Chemistry</b> i. Method of preparation of standard solutions of titrants. ii. Estimation of carbonate and hydroxide present together in a mixture. iii. Estimation of carbonate and bicarbonate present together in a mixture.	Dr. Sudipta Kr. Kundu	As per requirement
	<b>Physical Chemistry</b> i. Determination of pH of unknown solution (buffer), by color matching method. ii. Determination of heat of neutralization of a strong acid by a strong base. iii. Determination of heat of solute ion of oxalic acid from solubility measurement.	Mr. Rajib Mondal	As per requirement
CHEMHT-2	Valence Bond Theory, Electronic displacements, MO theory, Physical properties of organic molecules,	Dr. Raudra Tapas Dey	18L
	Mechanistic classification of organic reactions, Reactive intermediates	Dr. Rajib Sarkar	24L

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	Bonding geometries of organic compounds, Concept of chirality and symmetry, Relative and absolute configuration, Optical activity of chiral compounds.	Dr. Raudra Tapas Dey	18L
CHEMHP-2	Separation of organic molecules from their mixture, Determination of boiling point.	Dr. Raudra Tapas Dey	As per requirement
	Identification of a Pure Organic Compound by chemical test(s).	Dr. Rajib Sarkar	As per requirement
<b>Semester-III</b>			
CHEMHT-5	Transport processes	Mr. Rajib Mondal	20L
	Applications of Thermodynamics –I		20L
	Foundation of Quantum Mechanics		20L
CHEMHP-5	i. Study of viscosity of unknown liquid (glycerol, sugar) with respect to water. ii. Determination of partition coefficient for the distribution of I <sub>2</sub> between water and CCl <sub>4</sub> . iii. Determination of K <sub>eq</sub> for KI + I <sub>2</sub> = KI <sub>3</sub> , using partition coefficient between water and CCl <sub>4</sub> . iv. Conductometric titration of an acid (strong, weak/ monobasic, dibasic) against strong base. v. Study of saponification reaction conductometrically. vi. Verification of Ostwald's dilution law and determination of K <sub>a</sub> of weak acid.	Mr. Rajib Mondal	As per requirement
CHEMHT-6	Ionic Bonding	Dr. Rajib Sarkar	22L
	Covalent Bonding		28L
	Basic Metallurgy (Metal extraction and purification)		10L
CHEMHP-6	i. Estimation of Fe(II) and Fe(III) in a given	Dr. Rajib Sarkar	As per

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	mixture using $K_2Cr_2O_7$ solution ii. Estimation of Fe(III) and Cu(II) in a given mixture using $K_2Cr_2O_7$ solution iii. Estimation of Cr(VI) and Mn(II) in a given mixture using $K_2Cr_2O_7$ solution iv. Estimation of Fe(III) and Cr(VI) in a given mixture using $K_2Cr_2O_7$ solution v. Estimation of Fe(II) and Mn(II) in a given mixture using $KMnO_4$ solution vi. Estimation of Fe(III) and Ca(II) in a given mixture using $KMnO_4$ solution		requirement
<b>CHEMHT-7</b>	Chemistry of alkenes and alkynes	Dr. Raudra Tapas Dey	16L
	Aromatic Substitution reaction		8L
	Carbonyl and Related Compounds		30L
	Organometallics		6L
<b>CHEMHP-7</b>	Qualitative Analysis of Single Solid Organic Compounds.	Dr. Raudra Tapas Dey	As per requirement
<b>CHEMHS-1B</b>	Basic Analytical Chemistry, Complexometric titrations, Analysis of water, Analysis of food products, Chromatography, Column, ion-exchange chromatography, Analysis of cosmetics, Suggested Applications, Suggested Instrumental demonstrations.	Dr. Sudipta Kr. Kundu	30L
<b>Semester-V</b>			
<b>CHEMHT-11</b>	Coordination Chemistry – II, Reaction Kinetics and Mechanism	Dr. Rajib Sarkar	36L
	Magnetochemistry, Chemistry of d- and f-block elements	Dr. Sudipta Kr. Kundu	24L
<b>CHEMHP-11</b>	i. Estimation of available chlorine in bleaching powder using iodometry ii. Estimation of available oxygen in pyrolusite using	Dr. Rajib Sarkar	As per requirement

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	permanganometry iii. Estimation of Cu in brass using iodometry iv. Estimation of Fe in cement using permanganometry v. Estimation of chloride gravimetrically vi. Estimation of Ni(II) using DMG gravimetrically		
	i. Paper chromatographic separation of Ni(II) and Co(II) ii. Measurement of 10Dq by spectrophotometric method iii. Preparation of Mn(acac) <sub>3</sub> and determination of its $\lambda_{max}$ colorimetrically	Dr. Sudipta Kr. Kundu	As per requirement
CHEMHT-12	Molecular Spectroscopy	Mr. Rajib Mondal	24L
	Photochemistry		18L
	Surface phenomenon		18L
CHEMHTDSE-1A	Introduction and history of polymeric materials, Kinetics, Crystallization and crystallinity, Nature and structure of polymers, Determination of molecular weight, Glass transition temperature, Polymer Solution, Properties	Mr. Rajib Mondal	60L
CHEMHPDSE-1A	Polymer Synthesis, characterization, Analysis	Mr. Rajib Mondal	As per requirement
CHEMHTDSE-2C	Introduction to Green Chemistry, Principles and Designing a Chemical synthesis, Examples of Green Synthesis, Future Trends	Dr. Rajib Sarkar	60L
CHEMHPDSE-2C	Preparation and characterization of nanoparticle of gold using tea leaves, Preparation of biodiesel from vegetable/waste cooking oil, Photoreduction of benzophenone to benzopinacol in the presence of sunlight, Mechanochemical solvent free synthesis.	Dr. Rajib Sarkar	As per requirement

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<b>Semester-II</b>			
<b>Course Code</b>	<b>Topics</b>	<b>Name of the Lecturer</b>	<b>No. of Lecture</b>
<b>CHEMHT-3</b>	Redox Reactions and precipitation reactions	Dr. Sudipta Kr. Kundu	15L
	Acid-Base Concepts and Solvents		15L
	Chemical Thermodynamics – II	Mr. Rajib Mondal	12L
	Chemical kinetics		18L
<b>CHEMHP-3</b>	i. Estimation of Fe(II) using $K_2Cr_2O_7$ solution ii. Estimation of Fe(III) using $K_2Cr_2O_7$ and $KMnO_4$ solution iii. Estimation of $Ca^{2+}$ using $KMnO_4$ solution iv. Estimation of $Cu^{2+}$ iodometrically v. Estimation of $Cr^{3+}$ using $K_2Cr_2O_7$ solution	Dr. Sudipta Kr. Kundu	As per requirement
	i. Study of kinetics of acid-catalyzed hydrolysis of methyl acetate. ii. Study of kinetics of decomposition of $H_2O_2$	Mr. Rajib Mondal	As per requirement
<b>CHEMHT-4</b>	Chirality arising out of stereoaxis, Concept of prostereoisomerism, Conformation.	Dr. Raudra Tapas Dey	14L
	Reaction thermodynamics, Concept of organic acids and bases, Tautomerism, Reaction kinetics.		18L
	Free-radical substitution reaction, Nucleophilic substitution reactions, Elimination reactions.	Dr. Rajib Sarkar	28L



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<b>CHEMHP-4</b>	Organic Preparations: Nitration, Condensation reactions, Hydrolysis, Acetylation, Benzoylation, Side chain oxidation, Diazo coupling, Bromination, Redox reaction including solid-phase method, Green 'multi-component-coupling' reaction, Selective reduction	Dr. Raudra Tapas Dey and Dr. Rajib Sarkar	As per requirement
<b>Semester-IV</b>			
<b>CHEMHT-8</b>	Application of Thermodynamics– II	Mr. Rajib Mondal	20L
	Electrical Properties of molecules		20L
	Quantum Chemistry		20L
<b>CHEMHP-8</b>	i. Determination of solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator). ii. Potentiometric titration of Mohr's salt solution against standard $K_2Cr_2O_7$ solution. iii. Determination of $K_{sp}$ for AgCl by potentiometric titration of $AgNO_3$ solution against standard KCl solution. iv. Effect of ionic strength on the rate of Persulphate–Iodide reaction. v. Study of phenol-water phase diagram. vi. pH-metric titration of acid (mono-and di-basic) against strong base.	Mr. Rajib Mondal	As per requirement
<b>CHEMHT-9</b>	Radioactivity and nuclear chemistry	Dr. Sudipta Kr. Kundu	15L
	Chemistry of s and p-block elements		30L
	Coordination Chemistry – I		15L
<b>CHEMHP-9</b>	A. Complexometric Titration : i. Estimation of Hardness of water ii. Estimation of Ca(II) and Mg(II) in a mixture iii. Estimation of Zn(II) and Mg(II) in a	Dr. Sudipta Kr. Kundu	As per requirement



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	mixture B. Inorganic Preparation : i. Mohr's salt ii. Potassium tris(oxalato)chromate(III) trihydrate iii. Tetraamminecarbonatocobalt(III) nitrate iv. Potassiumbis(oxalato)cuprate(II) dihydrate v. Tris(ethylenediamine)nickel(II) chloride		
<b>CHEMHT-10</b>	Nitrogen compounds	Dr. Raudra Tapas Dey	8L
	Rearrangements: Mechanism with evidence and stereochemical features		10L
	Retrosynthetic analysis		20L
	Organic Spectroscopy (UV, IR, NMR)		22L
<b>CHEMHP-10</b>	i. Estimation of glycine by Sørensen's formol method ii. Estimation of glucose by titration using Fehling's solution iii. Estimation of sucrose by titration using Fehling's solution iv. Estimation of vitamin-C (reduced) v. Estimation of aromatic amine (aniline) by bromination (Bromate-Bromide) method vi. Estimation of phenol by bromination (Bromate-Bromide) method vii. Estimation of formaldehyde (Formalin) viii. Estimation of acetic acid in commercial vinegar ix. Estimation of urea (hypobromite method) x. Estimation of saponification value of oil/fat/ester	Dr. Raudra Tapas Dey	As per requirement
<b>CHEMHS-2A</b>	1. Drugs & Pharmaceuticals, 2. Fermentation, 3. Hands On Practical:	Dr. Rajib Sarkar	30L



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	(i) Preparation of Aspirin and its analysis. (ii) Preparation of magnesium bisilicate (Antacid).		
<b>Semester-VI</b>			
<b>CHEMHT-13</b>	Molecular symmetry and Point group	Dr. Sudipta Kr. Kundu	10L
	Bio-inorganic Chemistry	Dr. Rajib Sarkar	25L
	Organometallic Chemistry and Catalysis	Dr. Sudipta Kr. Kundu	25L
<b>CHEMHP-13</b>	Qualitative semimicro analysis Qualitative semimicro analysis of mixtures containing four radicals (excluding oxide and carbonate). Emphasis should be given to the understanding of the chemistry of different reactions and to assign the most probable composition. Basic Radicals: $K^+$ , $NH_4^+$ , $Mg^{2+}$ , $Ca^{2+}$ , $Ba^{2+}$ , $Sr^{2+}$ , $Al^{3+}$ , $Cr^{3+}$ , $Mn^{2+}$ , $Fe^{3+}/Fe^{2+}$ , $Co^{2+}$ , $Ni^{2+}$ , $Cu^{2+}$ , $Zn^{2+}$ , $Pb^{2+}$ , $Cd^{2+}$ , $Bi^{3+}$ , $Sn^{2+}/Sn^{4+}$ , $As^{3+}/As^{5+}$ , $Sb^{3+}/Sb^{5+}$ Acid Radicals: $Cl^-$ , $Br^-$ , $I^-$ , $S^{2-}$ , $SO_4^{2-}$ , $S_2O_3^{2-}$ , $SCN^-$ , $NO_3^-$ , $NO_2^-$ , $BO_3^{3-}$ , $PO_4^{3-}$ , $AsO_4^{3-}$ and $H_3BO_3$ Insoluble Materials: $Cr_2O_3$ , $Fe_2O_3$ , $Al_2O_3$ , $SnO_2$ , $PbSO_4$ , $BaSO_4$ , $SrSO_4$ iodometry iv. Estimation of Fe in cement using permanganometry v. Estimation of chloride gravimetrically vi. Estimation of Ni(II) using DMG gravimetrically	Dr. Rajib Sarkar & Dr. Sudipta Kr. Kundu	As per requirement
<b>CHEMHT-14</b>	Carbocycles and Heterocycles	Dr. Raudra Tapas Dey	16L
	Cyclic Stereochemistry		10L





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	Pericyclic Chemistry		8L
	Carbohydrates	Dr. Rajib Sarkar	12L
	Biomolecules		14L
<b>CHEMPT-14</b>	Chromatographic Separations and Spectroscopic Analysis of Organic Compounds	Dr. Raudra Tapas Dey and Dr. Rajib Sarkar	As per requirement
<b>CHEMHTDSE-3</b>	Crystal Structure	Mr. Rajib Mondal	20L
	Statistical Thermodynamics		18L
	Specific heat of solid, Third law of thermodynamics, Polymers		22L
<b>CHEMHPDSE-3</b>	Computer Programming based on numerical methods for: i. Roots of equations: (e.g. volume of van der Waals gas and comparison with ideal gas, pH of a weak acid). ii. Numerical differentiation (e.g., change in pressure for small change in volume of a van der Waals gas, potentiometric titrations). iii. Numerical integration (e.g. entropy/ enthalpy change from heat capacity data), probability distributions (gas kinetic theory) and mean values. iv. Simple exercises using molecular visualization software.	Mr. Rajib Mondal	As per requirement
<b>CHEMHTDSE-4</b>	A dissertation has to be prepared on consultation with teachers/mentors on a topic from any area of Chemistry. During examination a thorough viva-voce will be conducted by the examiners/adjudicators. The	Dr. Raudra Tapas Dey, Mr. Rajib Mondal, Dr. Rajib Sarkar & Dr. Sudipta Kr. Kundu	As per requirement



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	dissertation will be evaluated on the basis of written documents submitted by the candidate, originality and importance.		
<b>CHEMHPDSE-4</b>	A powerpoint presentation has to be prepared and a short oral presentation will be considered for continuous evaluation. A PDF file/print copy of the powerpoint will be required to be submitted.	Dr. Raudra Tapas Dey, Mr. Rajib Mondal, Dr. Rajib Sarkar & Dr. Sudipta Kr. Kundu	As per requirement



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Semester-I (Prog. Course and GE)			
Course Code	Topics	Name of the Lecturer	No. of Lecture
CHEMGT-1	Atomic Structure	Dr. Sudipta Kr. Kundu	9L
	Chemical Periodicity		9L
	Acids and Bases		8L
	Redox Reactions		4L
	Fundamentals of Organic Chemistry	Dr. Rajib Sarkar	5L
	Stereochemistry		5L
	Nucleophilic Substitution and Elimination Reactions		4L
	Aliphatic Hydrocarbons: Alkanes, Alkenes and Alkynes		12L
CHEMGP-1(Practical)	<b>Inorganic Chemistry - I</b> 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Estimation of oxalic acid by titrating it with $\text{KMnO}_4$ . 3. Estimation of water of crystallization in Mohr's salt by titrating with $\text{KMnO}_4$ . 4. Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ . 5. Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$ .	Dr. Sudipta Kr Kundu	As per requirement
	<b>Qualitative Analysis of Single Solid Organic Compound(s)</b> 1. Detection of special elements (N, Cl, and S) in organic compounds. 2. Solubility and Classification (solvents: $\text{H}_2\text{O}$ , dil. HCl, dil. NaOH, dil. $\text{NaHCO}_3$ ) 3. Detection of functional groups: Aromatic- $\text{NO}_2$ , Aromatic- $\text{NH}_2$ , $-\text{COOH}$ , carbonyl (no distinction of $-\text{CHO}$ and $>\text{C}=\text{O}$ needed), $-\text{OH}$ (phenolic) in solid organic compounds.	Dr. Rajib Sarkar	As per requirement

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	Experiments 1 to 3 with unknown (at least 6) solid samples containing not more than two of the above types of functional groups should be done.		
<b>Semester-III (Prog. Course and GE)</b>			
<b>CHEMGT-3</b>	<b>Chemical Energetics</b>	Mr. Rajib Mondal	12L
	<b>Chemical Equilibrium</b>		9L
	<b>Ionic Equilibria</b>		9L
	<b>Aromatic Hydrocarbons</b>	Dr. Raudra Tapash Dey	7L
	<b>Organometallic Compounds</b>		4L
	<b>Aryl Halides</b>		4L
	<b>Alcohols, Phenols and Ethers</b>		8L
	<b>Carbonyl Compounds</b>		7L
<b>CHEMGP-3 (Practical)</b>	<b>Physical Chemistry - II</b> <b>Thermochemistry</b> 1. Determination of heat capacity of calorimeter for different volumes 2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide 3. Determination of enthalpy of ionization of acetic acid 4. Determination of enthalpy of hydration of copper sulphate  <b>Ionic Equilibria</b> 1. Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass	Mr. Rajib Mondal	As per requirement



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	electrode) using pH meter and compare it with the indicator method 2. Preparation of buffer solutions and find the pH of an unknown buffer solution by colour matching method (using following buffers) a. Sodium acetate-acetic acid b. Ammonium chloride-ammonium hydroxide 3. Study of the solubility of benzoic acid in water.		
<b>CHEMGP-3</b>	<b>1. Organic Chemistry – II</b>  Identification of a pure organic compound 1. Solid compounds: oxalic acid, tartaric acid, succinic acid, resorcinol, urea, glucose, benzoic acid and salicylic acid. 2. Liquid Compounds: methyl alcohol, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde, chloroform and nitrobenzene	Dr. Raudra Tapash Dey	As per requirement
<b>CHEMGS – 1B (Skill Enhancement Course)</b>	<b>Basic Analytical Chemistry</b> <b>1. Introduction</b> Strategies of Analytical Chemistry and its interdisciplinary applicability. Protocol of sampling. Variability and validity of analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.	Dr. Sudipta Kr Kundu	2L



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	<b>2. Complexometry</b> Complexometric titrations, Chelation, Chelating agents, use of indicators. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.		4L
	<b>3. Analysis of water</b> Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods. Determination of pH, acidity and alkalinity of a water sample. Determination of Biological Oxygen Demand (BOD).		4L
	<b>4. Analysis of food products</b> Nutritional value of foods, ideas about food processing and food preservation and adulteration. Identification of adulterants in some common food items like coffee powder, asafoetida, chili powder, turmeric powder, coriander powder, and pulses, etc. Analysis of preservatives and coloring matter		4L
	<b>5. Chromatography:</b> Definition, general introduction on principles of chromatography, paper chromatography, TLC etc. Paper chromatographic separation of a mixture of metal ions ( $\text{Fe}^{3+}$ and		4L



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	Al <sup>3+</sup> ). To compare paint samples by TLC method.		
	<b>6. Ion-exchange:</b> Column, ion-exchange chromatography etc. Determination of ion exchange capacity of anion/cation exchange resin (using batch procedure if use of column is not feasible)		4L
	<b>7. Analysis of cosmetics</b> Major and minor constituents and their function. Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulfate. Determination of constituents of talcum powder: Magnesium oxide, Calciumoxide, Zinc oxide, and Calcium carbonate by complexometric titration.		3L
	<b>8. Suggested Applications (Any one)</b> To study the use of phenolphthalein in trap cases. To analyse arson accelerant. To carry out analysis of gasoline.		2L
	<b>9. Suggested Instrumental demonstrations</b> Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry. Spectrophotometric determination of Iron in Vitamin / Dietary Tablets. Spectrophotometric Identification and Determination		3L



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	of Caffeine and Benzoic Acid in Soft Drinks.		
<b>Semester-V (Prog. Course)</b>			
CHEMGTDSE-1	1. Chemical Analysis	Dr. Rajib Sarkar	14L
	2. Environmental Chemistry		16L
	Error Analysis and Computer Applications	Mr. Rajib Mondal	12L
	Industrial Chemistry		18L
CHEMGPDSE-1 (Practical)	<b>Analytical and Environmental Chemistry</b>  1. To find the total hardness of water by EDTA titration. 2. To find the pH of an unknown solution by comparing color of a series of HCl solutions + 1 drop of methyl orange, and a similar series of NaOH solutions + 1 drop of phenolphthalein. 3. To determine the rate constant for the acid catalyzed hydrolysis of an ester. 4. Determination of the strength of the H <sub>2</sub> O <sub>2</sub> sample. 5. To determine the solubility of a sparingly soluble salt, e.g. KHTa (one bottle)	Dr. Rajib Sarkar	As per requirement
	<b>Analytical and Industrial Chemistry</b>  1. Titration of Na <sub>2</sub> CO <sub>3</sub> and NaHCO <sub>3</sub> mixture vs HCl using phenolphthalein and methyl orange indicators.	Mr. Rajib Mondal	As per requirement

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Muragachha, Nadia, Pin – 741154

Phone No.: 03474-268008 web: <https://muragachhagovtcollege.in/> e-mail:  
chemistry.mgc15@gmail.com

### Teaching Plan (Prog. & GE course) of Odd Semester for the Academic Session- July 2022 - June 2023

	<p>2. Titration of HCl and CH<sub>3</sub>COOH mixture vs NaOH using two different indicators to find the concentration.</p> <p>3. Estimation of available oxygen in pyrolusite</p>		
<b>CHEMGS – 2B (Skill Enhancement Course)</b>	<p><b>1. Review of Concepts from Core Course</b></p> <p>Carbohydrates: Biological importance of carbohydrates, Metabolism, Cellular currency of energy (ATP), Glycolysis, Alcoholic and Lactic acid fermentations, Krebs cycle. Isolation and characterization of polysachharides.</p> <p>Proteins: Classification, biological importance; Primary and secondary and tertiary structures of proteins: <math>\alpha</math>-helix and <math>\beta</math>-pleated sheets, Isolation, characterization, denaturation of proteins.</p> <p>Enzymes: Nomenclature, Characteristics (mention of Ribozymes), and Classification; Active site, Mechanism of enzyme action, Stereospecificity of enzymes, Coenzymes and cofactors, Enzyme inhibitors, Introduction to Biocatalysis: Importance in “Green Chemistry” and Chemical Industry.</p> <p>Lipids: Classification. Biological</p>	Dr. Sudipta Kr Kundu	8L



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	importance of triglycerides and phosphoglycerides and cholesterol; Lipid membrane, Liposomes and their biological functions and underlying applications. Lipoproteins. Properties, functions and biochemical functions of steroid hormones. Biochemistry of peptide hormones.		
	<b>2. Biochemistry of disease: A diagnostic approach by blood/urine analysis</b>  Blood: Composition and functions of blood, blood coagulation. Blood collection and preservation of samples. Anaemia, Regulation, estimation and interpretation of data for blood sugar, urea, creatinine, cholesterol and bilirubin. Urine: Sampling and preservation, composition and estimation of constituents of normal and pathological urine		12L
	<b>3. Hands On Practical</b>  Identification and estimation of the following: i. Carbohydrates – qualitative and quantitative. ii. Lipids – qualitative. iii. Determination of the iodine number of oil. iv. Determination of the saponification number of oil.		10L



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	v. Determination of cholesterol using Liebermann- Burchard reaction. vi. Proteins – qualitative. vii. Isolation of protein. viii. Determination of protein by the Biuret reaction. ix. Determination of nucleic acids		
	2.		

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Semester-II (Prog. Course and GE)			
Course Code	Topics	Name of the Lecturer	No. of Lecture
CHEMGT-2	<b>Physical Chemistry – I</b> 1. Kinetic Theory of Gases and Real Gases	Mr. Rajib Mondal	12L
	2. Liquids		5L
	3. Solids		5L
	4. Chemical Kinetics		8L
	<b>Inorganic Chemistry - II</b> 1. Chemical Bonding and Molecular Structure	Dr. Raudra Tapash Dey	20L
	2. Comparative study of p-block elements		10L
CHEMGP-2 (Practical)	<b>Physical Chemistry – I</b> 1. Surface tension measurement (use of organic solvents excluded) a. Determination of the surface tension of a liquid or a dilute solution using a Stalagmometer b. Study of the variation of surface tension of a detergent solution with concentration 2. Viscosity measurement (use of organic solvents excluded) a. Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer b. Study of the variation of viscosity of an aqueous solution with concentration of solute 3. Study the kinetics of the following reactions a. Initial rate method: Iodide-persulphate reaction b. Integrated rate method: i. Acid hydrolysis of methyl acetate with hydrochloric acid ii. Compare the strengths of HCl and H <sub>2</sub> SO <sub>4</sub> by studying kinetics of hydrolysis of methyl acetate	Mr. Rajib Mondal	As per requirement

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	Inorganic Chemistry – II Qualitative semi-micro analysis of mixtures containing three radicals. Emphasis should be given to the understanding of the chemistry of different reactions. Acid Radicals: Cl <sup>-</sup> , Br <sup>-</sup> , I <sup>-</sup> , NO <sub>2</sub> <sup>-</sup> , NO <sub>3</sub> <sup>-</sup> , S <sup>2-</sup> , SO <sub>4</sub> <sup>2-</sup> , BO <sub>3</sub> <sup>3-</sup> , H <sub>3</sub> BO <sub>3</sub> . Basic Radicals: Na <sup>+</sup> , K <sup>+</sup> , Ca <sup>2+</sup> , Sr <sup>2+</sup> , Ba <sup>2+</sup> , Cr <sup>3+</sup> , Mn <sup>2+</sup> , Fe <sup>3+</sup> , Ni <sup>2+</sup> , Cu <sup>2+</sup> , NH <sub>4</sub> <sup>+</sup> .	Dr. Raudra Tapash Dey	As per requirement
<b>Semester-IV (Prog. Course and GE)</b>			
CHEMGT-4	<b>Physical Chemistry – III</b> <b>1. Solutions</b>	Mr. Rajib Mondal	7L
	<b>2. Phase Equilibria</b>		7L
	<b>3. Conductance</b>		8L
	<b>4. Electromotive force</b>		8L
	<b>Inorganic Chemistry - III</b> <b>1. Transition Elements (3d series)</b>	Dr. Sudipta Kr Kundu	10L
	<b>2. Coordination Chemistry</b>		10L
	<b>3. Crystal Field Theory (CFT)</b>		10L
CHEMGP-4(Practical)	<b>Physical Chemistry - III</b> (Minimum six experiments to complete) 1. Distribution Law (Any one) a. Study of the equilibrium of one of the following reactions by the distribution method: $I_2(aq) + I^-(aq) = I_3^-(aq)$ 2. Conductance a. Determination of dissociation constant of a weak acid (cell constant, equivalent conductance are also determined) b. Perform the following conductometric titrations: (Any one) i. Strong acid vs. strong base ii. Weak acid vs. strong base 3. Potentiometry	Mr. Rajib Mondal	As per requirement

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	<p>a. Perform the following potentiometric titrations:</p> <p>i. Weak acid vs. strong base</p> <p>ii. Potassium dichromate vs. Mohr's salt.</p>		
	<p><b>Inorganic Chemistry – III</b></p> <p>1. Complexometric estimation of (i) <math>Mg^{2+}</math> or (ii) <math>Zn^{2+}</math> using EDTA.</p> <p>2. Preparation of any two of the following complexes:</p> <p>a. tetraamminecarbonatocobalt (III) nitrate</p> <p>b. tetraamminecopper(II) sulphate</p> <p>c. potassium trioxalatochromate(III) trihydrate</p> <p>d. potassium bisoxalatocuprate(II) trihydrate</p>	Dr. Sudipta Kr Kundu	As per requirement
CHEMGS – 2A(Skill Enhancement Course)	<p><b>Pharmaceutical Chemistry</b></p> <p><b>1. Drugs &amp; Pharmaceuticals:</b></p> <p>Drug discovery, design and development; Basic Retrosynthetic approach.</p> <p>Synthesis of the representative drugs of the following classes: analgesicsagents, antipyretic agents, anti-inflammatory agents (Aspirin,paracetamol, Ibuprofen); antibiotics (Chloramphenicol); antibacterial andantifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide,Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam),Cardiovascular (Glyceryl trinitrate),antilaprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine).</p>	Dr. Rajib Sarkar	16 L
	<p><b>2. Fermentation:</b></p> <p>Aerobic and anaerobic fermentation. Production of (i) Ethyl alcohol andcitric acid, (ii) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.</p>		6L
	<p><b>3.Hands On Practical:</b></p>		8L

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	Preparation of Aspirin and its analysis. Preparation of magnesium bisilicate (Antacid)		
<b>Semester-VI (Prog. Course)</b>			
CHEMGTDSE-2	<b>Advanced Organic Chemistry</b> Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structures. <b>1. Carboxylic Acids and Their Derivatives</b> <b>2. Amines and Diazonium Salts</b>	Dr. Raudra Tapash Dey	20L
	<b>3. Amino Acids and Carbohydrates</b>		10L
	<b>Industrial Chemistry</b> <b>1. Polymers</b> <b>2. Paints</b> <b>3. Varnishes</b> <b>4. Synthetic dyes</b> <b>5. Drugs and pharmaceuticals</b>	Dr. Rajib Sarkar	14L
	<b>Industrial Chemistry</b> <b>6. Fermentation chemical</b> <b>7. Fats and oils</b> <b>8. Soaps and detergents</b> <b>9. Pesticides</b> <b>10. Food additives</b>		16L
CHEMGPDSE-2 (Practical)	<b>Advanced Organic Chemistry</b> 1. The following reactions are to be performed, noting the yield of the crude product: a. Nitration of aromatic compounds b. Condensation reactions c. Hydrolysis of amides/imides d. Acetylation of aromatic amines e. Benzoylation of aromatic amines 2. Purification of the crude product is to be made by crystallization from water/alcohol.	Dr. Raudra Tapash Dey	As per requirement

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	<b>Industrial Chemistry</b> 1. Estimation of saponification value of oil / ester / fat. 2. Estimation of available chlorine in bleaching powder. 3. Estimation of acetic acid in commercial vinegar. 4. Estimation of amino acid by formol titration	Dr. Rajib Sarkar	As per requirement
<b>CHEMGS – 2B (Skill Enhancement Course)</b>	<b>IT skills for Chemist</b> <b>1. Mathematics</b>  i. Fundamentals, mathematical functions, polynomial expressions, logarithms, the exponential function, units of a measurement, interconversion of units, constants and variables, equation of a straight line, plotting graphs. ii. Uncertainty in experimental techniques: Displaying uncertainties, measurements in chemistry, decimal places, significant figures, combining quantities. iii. Uncertainty in measurement: types of uncertainties, combining uncertainties. Statistical treatment. Mean, standard deviation, relative error. Data reduction and the propagation of errors. Graphical and numerical data reduction. Numerical curve fitting: the method of least squares (regression). iv. Algebraic operations on real scalar variables (e.g. manipulation of van der Waals equation in different forms). Roots of quadratic equations analytically and iteratively (e.g. pH of a weak acid). Numerical methods of finding roots (Newton Raphson, binary –bisection, e.g. pH of a weak acid not ignoring the ionization of	Mr. Rajib Mondal	30L

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	<p>water, volume of a van der Waals gas, equilibrium constant expressions).</p> <p>v. Differential calculus: The tangent line and the derivative of a function, numerical differentiation (e.g., change in pressure for small change in volume of a van der Waals gas, potentiometric titrations).</p> <p>vi. Numerical integration (Trapezoidal and Simpson's rule, e.g. entropy/enthalpy change from heat capacity data).</p> <p><b>2. Computer programming</b></p> <p>Constants, variables, bits, bytes, binary and ASCII formats, arithmetic expressions, hierarchy of operations, inbuilt functions. Elements of the BASIC language. BASIC keywords and commands. Logical and relative operators. Strings and graphics. Compiled versus interpreted languages. Debugging. Simple programs using these concepts. Matrix addition and multiplication. Statistical analysis. BASIC programs for curve fitting, numerical differentiation and integration (Trapezoidal rule, Simpson's rule), finding roots (quadratic formula, iterative, Newton-Raphson method).</p> <p><b>3. Hands On</b></p> <p>i. Introductory writing activities: Introduction to word processor and structure drawing (ChemSketch) software. Incorporating chemical structures, chemical equations, and expressions from chemistry (e.g. Maxwell-Boltzmann distribution law, Bragg's law, van der</p>		
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	<p>Waals equation, etc.) into word processing documents.</p> <p>ii. Handling numeric data: Spreadsheet software (Excel), creating a spreadsheet, entering and formatting information, basic functions and formulae, creating charts, tables and graphs. Incorporating tables and graphs into word processing documents. Simple calculations, plotting graphs using spreadsheet (Planck's distribution law, radial distribution curves for hydrogenic orbitals, gas kinetic theory- Maxwell-Boltzmann distribution curves as function of temperature and molecular weight), spectral data, pressure-volume curves of van der Waals gas (van der Waals isotherms), data from phase equilibria studies. Graphical solution of equations.</p> <p>iii. Numeric modelling: Simulation of pH metric titration curves. Excel functions LINEST and Least Squares. Numerical curve fitting, linear regression (rate constants from concentration- time data, molar extinction coefficients from absorbance data), numerical differentiation (e.g. handling data from potentiometric and pH metric titrations, pKa of weak acid), integration (e.g. entropy/enthalpy change from heat capacity data).</p> <p>iv. Statistical analysis: Gaussian distribution and Errors in measurements and their effect on data sets. Descriptive statistics using Excel. Statistical significance testing: The t test. The F test.</p> <p>v. Presentation: Presentation graphics</p>		
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