

Shri Rawatpura Sarkar University, Raipur



Examination Scheme & Syllabus

for

**Three Year Bachelor of Science
(Hons.) in Chemistry Programme**

B.Sc. (Hons.) Chemistry Semester-II

(Effective from the session: 2022-23)



Shri Rawatpura Sarkar University

Raipur, Chhattisgarh

Department of Chemistry

Faculty of Science,

Three Year Bachelor of Science (Hons.) in Chemistry Programme

B.Sc. (Hons.) Chemistry Semester-II

Scheme of Teaching and Examination

Outcome Based Education (OBC) and Choice Based Credit System (CBCS)

(Effective from the session: 2022-2023)

S. No.	Course Code	Course Title	Hours/Week			Credit	Maximum Marks			Sem End Exam Duration (Hrs)
			L	T	P		Continuation Evaluation	Semester End Examination	Total	
1	SSH02201T	Physical Chemistry-I	4	-	-	4	30	70	100	3.0
2	SSH02202T	Organic Chemistry-II	4	-	-	4	30	70	100	3.0
3	SSH02212T	Environmental Science	4	-	-	4	30	70	100	3.0
4	SSH02252T	Generic Elective II	4	-	-	4	30	70	100	3.0
5	SSH02281T	Chemistry Lab Course: III	-	-	4	2	15	35	50	5.0
6	SSH02282P	Chemistry Lab Course: IV	-	-	4	2	15	35	50	5.0
7	SSH02283P	Generic Elective: Lab II	-	-	4	2	15	35	50	5.0
Total teaching hrs/week: 28			Total Credits			22	Total Marks		550	

Generic Electives (Semester I to IV): Zoology, Bioscience, Maths and Physics

Semester:	Semester I	Semester II	Semester III	Semester IV
Subject:	Zoology I	Zoology II	Bioscience I	Bioscience II
	Maths I	Maths II	Physics I	Physics II



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Course Title	Physical Chemistry I			
Course Code	SSH02201T			
Course Credits	L	T	P	TC
	4	-	-	4
Prerequisites	FUNDAMENTAL PHYSICAL CHEMISTRY			
Course Objectives	<ul style="list-style-type: none"> To understand the importance of physical chemistry 			
Course Contents	<p>UNIT- I</p> <p>Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path and viscosity of gases, including their temperature and pressure dependence, relation between mean free path and coefficient of viscosity, calculation of σ from η; variation of viscosity with temperature and pressure. Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities factor, Z, and its variation with pressure for different gases. Causes of deviation from ideal Behaviour of real gases: Deviations from ideal gas behaviour, compressibility behaviour.</p> <p>UNIT -II</p> <p>Vander Waals equation of state, its derivation and application in explaining real gas behaviour, mention of other equations of state (Berthelot, Dietrici); virial equation of state; van der Waals equation expressed in virial form and calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding states, Liquid state: Qualitative treatment of the structure of the liquid state; Radial distribution function; physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases, Qualitative discussion of structure of water.</p> <p>UNIT -III</p> <p>Solid state: Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analysis of powder diffraction patterns of NaCl, CsCl and KCl. Defects in crystals. Glasses and liquid crystals.</p>			



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	<p>UNIT- IV</p> <p>Ionic equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di- and triprotic acids (exact treatment). Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers in analytical chemistry and biochemical processes in the human body.</p> <p>UNIT -V</p> <p>Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. Qualitative treatment of acid – base titration curves (calculation of pH at various stages). Theory of acid–base indicators; selection of indicators and their limitations. Multistage equilibria in polyelectrolyte systems; hydrolysis and hydrolysis constants.</p>
Course Outcomes	<ul style="list-style-type: none">• On the completion of this course successfully student will be able to <p>CO 1 : Understand the postulates and derivation of the kinetic gas equation</p> <p>CO 2 : Gain the knowledge of Vander Waals equation of state, its derivation and application</p> <p>CO 3 : know the Nature of the solid state, law of constancy of interfacial angles, law of rational indices.</p> <p>CO 4 : understand the Ionic equilibria</p> <p>CO 5 : understand the Solubility and solubility product and its application</p>
Text Books	<ol style="list-style-type: none">1. Atkins, P.W. & Paula, J. de Atkin's Physical Chemistry 10th Ed., Oxford University Press (2014).2. Ball, D. W. Physical Chemistry Thomson Press, India (2007).3. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).4. Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).5. Engel, T. & Reid, P. Physical Chemistry 3rd Ed. Pearson (2013).6. Peter, A. & Paula, J. de. Physical Chemistry 10th Ed., Oxford University Press (2014).7. Castellan, G. W. Physical Chemistry 4th Ed., Narosa (2004).
Reference Books	<ol style="list-style-type: none">1. Engel, T. & Reid, P. Physical Chemistry 3rd Ed., Prentice-Hall (2012).2. McQuarrie, D.A. & Simon, J.D. Molecular Thermodynamics Viva Books Pvt. Ltd.: New Delhi (2004).3. Assael, M.J.; Goodwin, A.R.H.; Stamatoudis, M.; Wakeham, W.A. & Will, S. Commonly Asked Questions in Thermodynamics. CRC Press: NY



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	<p>(2011).</p> <p>4. Levine, I.N. Physical Chemistry 6th Ed., Tata McGraw Hill(2010).</p> <p>Metz, C.R. 2000 solved problems in chemistry, SchaumSeries(2006).</p>
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Course Title	ORGANIC CHEMISTRY :II			
Course Code	SSH02202T			
Course Credits	L	T	P	TC
	4	-	-	4
Prerequisites	Organic Chemistry-I			
Course Objectives	Understand the basic knowledge of basics of organic chemistry			
Course Contents	<p>UNIT I</p> <p>Alkyl halides: Methods of preparation, nucleophilic substitution reactions – S_N1, S_N2 and S_Ni mechanisms with stereochemical aspects and effect of solvent etc.; nucleophilic substitution vs. elimination.</p> <p>Aryl halides: Preparation, including preparation from diazonium salts. nucleophilic aromatic substitution; S_NAr, Benzyne mechanism. Relative reactivity of alkyl, allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.</p> <p>UNIT II</p> <p>Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt-Blanc Reduction; Preparation and properties of glycols: Oxidation by periodic acid and lead tetraacetate, Pinacol-Pinacolone rearrangement; Phenols: Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe’s–Schmidt Reactions, Fries and Claisen rearrangements with mechanism;</p> <p>UNIT III</p> <p>Carbonyl Compounds: Structure, reactivity and preparation; Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism; Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation, Claisen-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann and Benzil-Benzilic acid rearrangements, haloform reaction and</p>			



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	<p>Baeyer Villiger oxidation, α- substitution reactions, oxidations and reductions (Clemmensen, Wolff-Kishner, LiAlH_4, NaBH_4, MPV, PDC and PGC); Addition reactions of unsaturated carbonyl compounds: Michael addition. Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate.</p> <p>UNIT IV</p> <p>Carboxylic Acids and their Derivatives: Preparation, physical properties and reactions of monocarboxylic acids: Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids: succinic/phthalic, lactic, malic, tartaric, citric, maleic and fumaric acids; Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic substitution at acyl group - Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann- bromamide degradation and Curtius rearrangement.</p> <p>UNIT V</p> <p>Ethers and Epoxides: Preparation and reactions with acids. Reactions of epoxides with alcohols, ammonia derivatives and LiAlH_4, Sulphur containing compounds: Preparation and reactions of thiols, thioethers and sulphonic acids, Organometallic compounds of Mg and Li – Use in synthesis of organic compounds.</p>
Course Outcomes	<p>On the completion of this course successfully student will be able to understand</p> <p>CO 1 : preparation and reaction of Alkyl and acyl halides</p> <p>CO 2 : Synthesis of Alcohols and its mechanism</p> <p>CO 3 : Nucleophilic additions and its mechanism</p> <p>CO 4 : Preparation of Carboxylic Acids and their Derivatives</p> <p>CO 5 : Preparation and reactions of Ethers and Epoxides</p>
Text Books	<ol style="list-style-type: none">1. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).2. Finar, I.L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
References Books	<ol style="list-style-type: none">1. Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.2. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.



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Course Title	Environmental Science				
Course Code	SSH02212T				
Course Credits	L	T	P	Total	
	2	-	-	2	
Prerequisites	BASIC SCIENCE				
Course Objectives	<p>Upon completion of the course the student shall be able to</p> <ul style="list-style-type: none"> • Create the awareness about environmental problems among learners • Impart basic knowledge about the environment and its allied problems. • Develop an attitude of concern for the environment. • Motivate learner to participate in environment protection and environment improvement. • Acquire skills to help the concerned individuals in identifying and solving environmental problems. • Strive to attain harmony with nature. 				
Course Contents	<p>UNIT -I The multidisciplinary nature of environmental studies Definition, scope and importance. Need for public awareness</p> <p>UNIT- II Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.</p> <p>(a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.</p> <p>(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.</p> <p>(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.</p> <p>(d) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.</p> <p>(e) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. · Role of an individual in conservation of natural resources. · Equitable use of resources for</p>				



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	<p>sustainable lifestyles.</p> <p>UNIT -III</p> <p>Ecosystems · Concept of an ecosystem · Structure and function of an ecosystem · Producers, consumers and decomposers Energy flow in the ecosystem Ecological succession Food chains, food webs and ecological pyramids Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)</p> <p>UNIT -IV</p> <p>Biodiversity and its conservation · Introduction – Definition: genetic, species and ecosystem diversity · Biogeographical classification of India · Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values Biodiversity at global, national and local levels · India as a mega-diversity nation · Hot-spots of biodiversity · Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts · Endangered and endemic species of India · Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity</p> <p>UNIT -V</p> <p>Environmental Pollution Definition · Causes, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear pollution · Solid waste management: Causes, effects and control measures of urban and industrial wastes. · Role of an individual in prevention of pollution · Pollution case studies · Disaster management: floods, earthquake, cyclone and landslides</p>
Course Outcomes	<p>On the completion of this course successfully student will be able to</p> <p>CO 1 : Understand multidisciplinary nature of environmental studies</p> <p>CO 2 : Gain the knowledge Natural Resources and its types</p> <p>CO 3 : Learn the Concept of an ecosystem and function of an ecosystem</p> <p>CO 4 : Study on Biodiversity and its conservation</p> <p>CO 5 : Understand the types of Environmental Pollution and its effects.</p>
Text Books	<ol style="list-style-type: none"> 1. Environment and Ecology by Piyush Kant Pandey and Dipti Gupta (Sum India Publication) 2. A Textbook of Environmental Chemistry and Pollution Control by S.S. Dara (S. Chand and Company) 3. Masters, G.M. Introduction to Environment Engineering and Science (Prentice Hall of India). 4. Environmental Chemistry by A.K. Dey (Eastern Ltd.). 5. Environmental Chemistry by B.K. Sharma (Krishna Prakashan).
Reference	<ol style="list-style-type: none"> 1. Nebel B.J. Environmental Science (Prentice Hall of India-1987).



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Books	<p>2. Environmental Biotechnology by S.N. Jogdand (Himalaya Publishing House).</p> <p>3. Introduction to Environmental Biotechnology by A.K. Chatterji (Prentice Hall of India).</p>
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Course Title	ZOOLOGY : II			
Course Code	SSH02252T			
Course Credits	L	T	P	TC
	4	-	-	4
Prerequisites	Knowledge of Zoology I			
Course Objectives	<ul style="list-style-type: none"> To make students familiar with the classification of animals (Non-chordates) and study about the major classes of Coelomates. 			
Course Contents	<p>UNIT I Introduction to Coelomates;-Evolution of Coelom and Origin and Evolution of Metamerism.</p> <p>UNIT II Annelida;-General characteristics and Classification up to classes Digestive System, Circulatory System, Excretory System, and Reproduction in Annelida.</p> <p>UNIT III Arthropoda;-General characteristics and Classification up to classes, Vision, Respiration and Nervous System in Arthropoda, Crustacean larva, Metamorphosis in Insects, Social life in bees and termites.</p> <p>UNIT IV Mollusca;-General characteristics and Classification up to classes, Respiration in Mollusca, Nervous system in Mollusca Torsion and detorsion in Gastropoda, Pearl formation in bivalves, Evolutionary significance of trochophore larva.</p> <p>UNIT V Echinodermata;-General characteristics and Classification up to classes, Water-vascular system in Asteroidea, Larval forms in Echinodermata, Affinities with Chordates.</p>			
Course Outcomes	<p>On the completion of this course successfully student will be able to</p> <p>CO 1 : Understand the Evolution of coelom and metamerism</p>			



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	<p>CO 2 : Gain knowledge on Annelida</p> <p>CO 3 : Learn the Vision and Respiration in Arthropoda</p> <p>CO 4 : Learn about Respiration in Mollusca Torsion and detorsion in Gastropoda</p> <p>CO 5 : Study on Larval forms in Echinodermata Affinities with Chordates</p>
Text Books	<p>1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.</p> <p>2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science</p>
References Book	<p>1. Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson</p>



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Course Title	MATHS - II : Differential Equation				
Course Code	SBS08201T				
Course Credits	L	T	P	TC	
	4			4	
Prerequisites	Basic knowledge about foundation of mathematics				
Course Objectives	<ul style="list-style-type: none"> To acquire a basic body of Mathematical knowledge that will provide the students with a strong foundation for further study of mathematical science. 				
Course Contents	<p>NIT-I Differential Equations of first order and first degree: Exact Differential equation and integrating factors of first order differential equations, Reducible second order differential equations. Differential equations solvable for P, solvable for Y, solvable for X, Clairaut's Equation. Applications of first order differential equations to acceleration-velocity model, Growth and decay model.</p> <p>UNIT-II Family of curves: Trajectories, orthogonal Trajectories, self orthogonal families, differential equations of Family or orthogonal Trajectories, Self orthogonal families.</p> <p>UNIT-III Linear differential equation with constant coefficient: Homogeneous and Non homogeneous linear differential equation, Finding particular integrals. Differential equation reducible to linear equation with constant coefficient. Cauchy's linear equation, Legendres equation.</p> <p>UNIT-IV Linear Differential Equations of Second order, method of variable of parameters: simultaneous Differential Equations of first order.</p> <p>UNIT-V Method of variation of parameters, Cauchy Linear equation or Euler equation. Initial and boundary value problem, Picard's method of successive approximation, Series' solution method of Frobenius.</p>				
Course Outcomes	The course will enable the students to: CO 1: Learn basics of higher order differential equations and applications. CO 2: Learn about geometrical meaning of differential equation and Orthogonal Trajectories. CO 3: Solve first order non-linear differential equations and linear differential equations using various techniques.				



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	CO 4: Learn about Linear differential equation of second order. CO 5: Apply these techniques to solve and analyze various mathematical models
Text Books	<ol style="list-style-type: none">1. A text book of differential equation by H.K.PATHAK and D.C.Agrawal.(Text) shiksha sahitya prakashan .Meerut.2. S.L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004.3. C.H. Edwards and D.E. Penny, Differential Equations and Boundary Value problems4. Computing and Modeling, Pearson Education India, 2005.Gorakh Prasad and H.C. Gupta, Text Book on Coordinate Geometry, Pothishala Pvt. Ltd., Allahabad.
References Books	<ol style="list-style-type: none">1. Murray, D., Introductory Course in Differential Equations.2. Simmons, Differential Equations.3. R.J.T. Bill, Elementary Treatise on Coordinate Geometry of three dimensions, Machmillan India Ltd. 1994.4. S. L Loney. The Elements of Co-ordinate geometry, Macmillan & Company, London5. P.K. jain & Khalil Ahmad . A Text Book of Analytical geometry of three dimensions, Wiley Eastern Ltd 1999.



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Course Title	CHEMISTRY LAB COURSE: III			
Course Code	SSH02281P			
Course Credits	L	T	P	TC
	-	-	2	2
Prerequisites	Practical knowledge of chemistry Lab course I			
Course Objectives	<ul style="list-style-type: none"> To enable the students to develop skills inorganic, physical and organic chemistry. 			
Course Contents	<p>Performed any 10 experiment</p> <ol style="list-style-type: none"> Iodo / Iodimetric Titrations <ol style="list-style-type: none"> Estimation of Cu(II) and $K_2Cr_2O_7$ using sodium thiosulphate solution (Iodimetrically). Estimation of (i) arsenite and (ii) antimony in tartar-emetica iodimetrically Estimation of available chlorine in bleaching powder iodimetrically. Inorganic preparations <ol style="list-style-type: none"> Cuprous Chloride, Cu_2Cl_2 Preparation of Manganese(III) phosphate, $MnPO_4 \cdot H_2O$ Preparation of Aluminium potassium sulphate $KAl(SO_4)_2 \cdot 12H_2O$ (Potash alum) or Chromealum Determination of heat capacity of a calorimeter for different volumes using change of enthalpy data of a known system (method of back calculation of heat capacity of calorimeter from known enthalpy of solution or enthalpy of neutralization). Determination of heat capacity of the calorimeter and enthalpy of neutralization of hydrochloric acid with sodium hydroxide. Calculation of the enthalpy of ionization of ethanoic acid. Determination of heat capacity of the calorimeter and integral enthalpy(endothermic and exothermic) solution of salts. Determination of basicity /proticity of a polyprotic acid by the thermochemical method in terms of the changes of temperatures observed in the graph of temperature versus time for different additions of a base. Also calculate the enthalpy of neutralization of the first step. Determination of enthalpy of hydration of copper sulphate. Study of the solubility of benzoic acid in water and determination of ΔH. 			



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	Any other experiment carried out related to inorganic chemistry and physical chemistry.
Course Outcomes	<p>On the completion of this course successfully student will be able to</p> <p>CO 1 : Performed the Iodo / Iodimetric Titrations</p> <p>CO 2 : Synthesis of Inorganic preparations, Cuprous Chloride, MnPO₄.H₂O, Potash alum</p> <p>CO 3 : Understand the enthalpy of ionization of ethanoic acid.</p> <p>CO 4 : Practically perform the enthalpy of hydration of copper sulphate.</p> <p>CO 5 : Study of the solubility of benzoic acid in water and determination of ΔH.</p>
Text Books	<ol style="list-style-type: none">1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.3. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).4. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry, Universities Press.
References Books	<ol style="list-style-type: none">1. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).2. Garland, C.W.; Nibler, J.W. & Shoemaker, D.P. Experiments in Physical Chemistry 8th Ed.; McGraw-Hill: New York (2003).3. Halpern, A.M. & McBane, G.C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York (2003).



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Course Title	CHEMISTRY LAB COURSE: IV			
Course Code	SSH02282P			
Course Credits	L	T	P	TC
	-	-	2	2
Prerequisites	Practical knowledge of chemistry Lab course II			
Course Objectives	<ul style="list-style-type: none"> To enable the students to develop practical skills on organic chemistry experiments 			
Course Contents	<p>Performed any 10 experiment</p> <ol style="list-style-type: none"> Functional group tests for alcohols, phenols, carbonyl and carboxylic acid group. Organic preparations: <ol style="list-style-type: none"> Acetylation of one of the following compounds: amines (aniline, <i>o</i>-, <i>m</i>-, <i>p</i>-toluidines and <i>o</i>-, <i>m</i>-, <i>p</i>-anisidine) and phenols (β-naphthol, vanillin, salicylic acid) by any one method: <ol style="list-style-type: none"> Using conventional method. Using green approach Benzoylation of one of the following amines (aniline, <i>o</i>-, <i>m</i>-, <i>p</i>-toluidines and <i>o</i>-, <i>m</i>-, <i>p</i>-anisidine) and one of the following phenols (β-naphthol, resorcinol, <i>p</i>-cresol) by Schotten-Baumann reaction Oxidation of ethanol/ isopropanol (Iodoform reaction). Bromination of any one of the following: <ol style="list-style-type: none"> Acetanilide by conventional methods Acetanilide using green approach (Bromate-bromide method) Nitration of any one of the following: <ol style="list-style-type: none"> Acetanilide/nitrobenzene by conventional method Salicylic acid by green approach (using ceric ammonium nitrate). Selective reduction of <i>meta</i>-dinitrobenzene to <i>m</i>-nitroaniline. Reduction of <i>p</i>-nitrobenzaldehyde by sodium borohydride. Hydrolysis of amides and esters. Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde. S-Benzylisothiuronium salt of one each of water soluble and water insoluble acids (benzoic acid, oxalic acid, phenyl acetic acid and 			



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	<p>phthalic acid).</p> <p>xi. Aldol condensation using either conventional or green method.</p> <p>xii. Benzil-Benzilic acid rearrangement.</p> <p>3. Any other experiment carried out related to organic chemistry.</p> <p>Any other experiment carried out related to organic chemistry and physical chemistry.</p>
Course Outcomes	<p>On the completion of this course successfully student will be able to</p> <p>CO 1 : Analysis the Functional group tests for alcohols, phenols, carbonyl and carboxylic acid group.</p> <p>CO 2 : Performed the Organic preparations: Using conventional and green method</p> <p>CO 3 : Perform the Iodoform reaction</p> <p>CO 4 : Synthesis of Salicylic acid by green approach</p> <p>CO 5 : Perform the Hydrolysis of amides and esters</p>
Text Books	<p>1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)</p> <p>2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)</p>
References Books	<p>1. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).</p>



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Course Title	GENERIC ELECTIVE : Lab II			
Course Code	SSH02283P			
Course Credits	L	T	P	TC
	-	-	2	2
Prerequisites	Practical knowledge of Zoology Lab course: I			
Course Objectives	<ul style="list-style-type: none"> To be familiar with the different specimens annelids 			
Course Contents	<ol style="list-style-type: none"> Study of following specimens: Annelids- Aphrodite, Nereis, Heteronereis, Sabella, Serpula, Chaetopterus, Pheretima, Hirudinaria Arthropods - Limulus, Palamnaeus, Palaemon, Daphnia, Balanus, Sacculina, Cancer, Eupagurus, Scolopendra, Julus, Bombyx, Periplaneta, termites and honey bees Onychophora–Peripatus Molluscs - Chiton, Dentalium, Pila, Doris, Helix, Unio, Ostrea, Pinctada, Sepia, Octopus, Nautilus Echinodermates - Pentaceros/Asterias, Ophiura, Clypeaster, Echinus, Cucumaria and Antedon. Study of digestive system, septal nephridia and pharyngeal nephridia of earthworm. T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm. Mount of mouth parts and dissection of digestive system and nervous system of Periplaneta. To submit a Project Report on any related topic to larval forms (crustacean, mollusk and echinoderm). 			
Course Outcomes	<p>On the completion of this course successfully student will be able to</p> <p>CO 1 : Study on annelids specimens</p> <p>CO 2 : Study of digestive system, septal nephridia and pharyngeal nephridia of earthworm.</p> <p>CO 3 : T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm</p> <p>CO 4 : Dissect Periplaneta to study the different parts of the digestive system.</p> <p>CO 5 : Dissect Periplaneta to study the Nervous system.</p>			
Text Books	1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition			



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	2. Barnes, R.S.K., Calow, P., Olive, P. J. W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
References Books	1. Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson

Course Title	GENERIC ELECTIVE : Lab II			
Course Code	SSH02284P			
Course Credits	I	T	P	TC
	-	-	2	2
Prerequisites	Preliminary Knowledge of Calculus			
Course Objectives	<ul style="list-style-type: none"> To become aware of the applications of mathematics across science and technology, and to learn how to use mathematical ideas and techniques to solve real life problem 			
Course Contents	<p>List of Practical (using any software)</p> <p>Addition and subtraction of Matrix</p> <p>(i) Plotting of graphs of function e^{ax+b}, $\log(ax+b)$, $1/(ax+b)$, $\sin(ax+b)$, $\cos(ax+b)$, $ax+b$ and to illustrate the effect of a and b on the graph.</p> <p>(ii) Plotting the graphs of polynomial of degree 4 and 5, the derivative graph, the second derivative graph and comparing them.</p> <p>(iii) Sketching parametric curves (Eg. Trochoid, cycloid, epicycloids, hypocycloid).</p> <p>(iv) Obtaining surface of revolution of curves.</p> <p>(v) Tracing of conics in cartesian coordinates/ polar coordinates.</p> <p>(vi) Sketching ellipsoid, hyperboloid of one and two sheets, elliptic cone, elliptic, paraboloid, hyperbolic paraboloid using cartesian coordinates.</p> <p>(vii) Matrix operation (addition, multiplication, inverse, transpose).</p>			
Course Outcomes	<p>On the completion of this course successfully student will be able to</p> <p>CO 1 : Study on Plotting of graphs of function</p>			



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	<p>CO 2 : Plotting the graphs of polynomial of degree 4 and 5</p> <p>CO 3 : Sketching parametric curves such as Trochoid, cycloid, epicycloids, hypocycloid.</p> <p>CO 4 : Trace of conics in cartesian coordinates/ polar coordinates</p> <p>CO 5 : Understand the Matrix operation applications</p>
Text Books	<ol style="list-style-type: none">1. Gorakh Prasad, Differential Calculaus, Pothishala Private Ltd. Allahabad.2. Gorakh Prasad, Integral Calculus, Pothishala Private Ltd. Allahabad.3. D.A. Murray Introductory Course in Differential Equations, Orient Longman (India), 1976
References Books	<ol style="list-style-type: none">1. N. Saran and S.N. Nigam, Introduction to vector Analysis, Pothishala Pvt. Ltd. Allahabad.2. Gorakh Prasad and H.C. Gupta, Text Book on Coordinate Geometry, Pothishala Pvt. Ltd., Allahabad.3. R.J.T. Bill, Elementary Treatise on Coordinate Geometry of three dimensions, Machmillan India Ltd. 1994