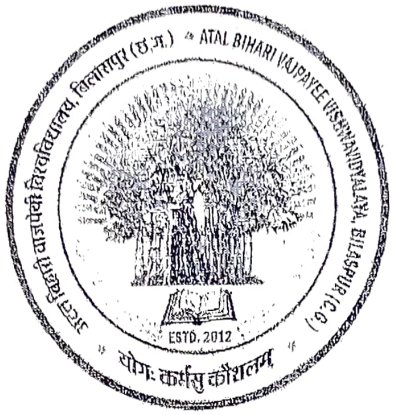
Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C.G.)



Scheme and Syllabus

of

M. Sc. (Chemistry)

Program Code: MSCCHER102

Semester system for affiliated college
(As per LOCF and credit system)

w.e.f. 2024-2025

(As approved by AC and EC meetings held on 16.08.2023 and 18.04.2023 respectively)

Scheme of M.Sc. (Chemistry) under Semester System
Program Code: MSCCHER102

Semester	Course Code	Subject Name	Credit			Total Credit	Marks			
							ESE	IA	Total	
			L	T	P				Max	Min
Third	CHEMT301	Application of Spectroscopy	3	1	-	4	80	20	100	36
	CHEMT302	Chemistry of Bio-Organic and Bio-Inorganic	3	1	-	4	80	20	100	36
	CHEMT303	Nano Chemistry and Computer Programming	3	1	-	4	80	20	100	36
	CHEMT305	Elective-II A: Transition Metal chemistry	3	1	-	4	80	20	100	36
	CHEMT306	Elective-II B: Medicinal Chemistry								
	CHEMT307	Elective-II C: Advanced Quantum Chemistry								
	CHEMP301	Lab 5:Physical Chemistry	-	-	2	2	-	-	100	36
	CHEMP302	Lab 6:General	-	-	2	2	-	-	100	36
	Subtotal		**12**	**4**	**4**	**20**	-	-	**600**	
Fourth	CHEMT401	Photo Chemistry and Solid State chemistry	3	1	-	4	80	20	100	36
	CHEMT402	Green and environmental chemistry	3	1	-	4	80	20	100	36
	CHEMT403	Subject 19 Analytical Chemistry	3	1	-	4	80	20	100	36
	CHEMT405	Elective-III A: Supra molecular Chemistry	3	1	-	4	80	20	100	36
	CHEMT406	Elective-III B: Chemistry of natural Products								
	CHEMT407	Elective-III C: Computation Chem.								
	CHEMP401	Lab 7:Dissertation	-	-	2	2	-	-	100	36
	CHEMP402	Lab 8:Special	-	-	2	2	-	-	100	36
	Subtotal		**12**	**4**	**4**	**20**	-	-	600	
Total			**48**	**16**	**16**	**80**	-	-	**2400**	

Note: *Students have to opt one paper in semester 2,3,4 from the pool of Elective Group A,B,C(IA,IIA,IIIA Or IB,IIB,IIIB Or IC,IIC,IIIC)*

Abbreviations used:

ESE: End Semester Exam
IA: Internal Assessment

Part A: Introduction			
Program: M.Sc. Chemistry		Semester: IV	w.e.f.: 2024-2025
1.	Course Code	**CHEMT401**	
2.	Course Title	**Photo Chemistry & Solid State Chemistry**	
3.	Course Type	**Theory**	
4.	Pre-requisite (if any)	**As per Rules of Atal Bihari Vajpayee Vishwavidyalaya Bilaspur**	
5.	Course Learning. Outcomes (CLO)	**At the end of this course, the students will be able to understand:** • Introduction of Photochemistry • Photochemistry of Alkenes • Photochemistry of Carbonyl compounds • Photochemistry of Aromatic Compounds • Some important photochemical reactions • Basics of solid-state chemistry, crystal defects • Electronic Properties of solids &Band theory	
6.	**Credit Value**	**(3L +1T) = 04**	
7.	**Total Marks**	**Internal Marks: 20** **External Marks: 80**	**Min Passing Marks:36**

Part B: Content of the Course		
Unit	**Topics**	**Total Hours**
I.	**Photochemical Reactions**: Fate of excited molecule.Determinationof Reaction Mechanism, Classification, rate constants and life timesof reactive energy states - Determination of rate constants of reactions. Effect of light intensity on the rate of Photochemical Reactions, Types of Photochemical reactions, Photo dissociation, Gas phase Photolysis , **Photo Chemistry of Alkenes :-** Intramolecular reactions of the olefinic bond, geometrical isomerism, cyclisation reactions. rearrangement of 1,4- and 1,5-dienes.	12
II.	**Photochemistry of Carbonyl Compounds:-** Intramolecular reactions saturated, cyclic and acyclic, B, y-unsaturated and a,ß-unsaturated compounds, of carbonyl compounds cyclohexadienones. Intermolecular cycloaddition reactions - dimerization and oxetane formation. **Photochemistry of Aromatic Compounds** :Isomerization, additions and substitutions.	12
III.	**Miscellaneous Photochemical Reactions:**-Photo Fries rearrangement, Barton reaction. [8L]Singlet oxygen and photo-oxygenation reactions. Photo chemically induced Radical Reactions. Chemiluminescence, Photochemistry of Vision, Photochemical smog	12

IV.	**Solid State Reactions:** General principles, experimental procedure, co-precipitation as a precursor to solid state point reactions, kinetics of soli reactions. **Crystal Defects and Non-Stoichiometry: Perfect** and imperfect crysta intrinsic and extrinsic defects, Point Defects, line and plane defects, Sch defects and Frenkel defects. Thermodynamics of Schottky and Frenkel formation, colourcentres, non-stoichiometry and defects.	12
V.	**Electronic Properties and Band Theory**:Metals, insulators and semiconductors, electronic structure of solids, band theory, band structu metals, insulators and semiconductors, Intrinsic and extrinsic semicond doping semiconductors, p-n junctions, super conductors. **Organic Solids:** Electrically conducting solids, organic charge transfer complex, organic metals, new superconductors.	12

Part C - Learning Resource

1. Concepts of Inorganic Photochemsitry, A.W.Admanson and P.D. Flesischaur, Willey.
2. Inorganic Photochemistry, J. Chem, Educ, Vol 60 No.-10, 1983
3. Progress in inorgtanic Chemistry Vol 30ed, S.J. Lippard, Wiley.
4. Coordination Chem Revs., 1981 Vol 39, 121, 131, 1975, 15, 321, 1990,97,313
5. Photochemistry of Coordinatin compound, V. Balzan and V. Carassiti Adacdemic Press.
6. Elements of Inorganic Photochemistry, G.J. Ferraudi Wiley.

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

Part A: Introduction			
Program: M.Sc. Chemistry	Semester: IV		w.e.f.: 2024-2025
1.	Course Code	CHEMT402	
2.	Course Title	Green & Environmental Chemistry	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	As per Rules of Atal Bihari Vajpayee Vishwavidyalaya Bilaspur	
5.	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Knowing the 12 principles of Green Chemistry. • Identification of greener solvents and recycling of these including catalysts. • Microwave mediated organic synthesis • Calculate the atomic efficiency and E-factors of chemical reactions and processes. • Compare actual industrial chemical syntheses/processes and identify their strengths and weaknesses in a green chemistry perspective. • Origin of waste water, water pollutants and their effects. • Measurements of DO, BOD, COD and their significance as pollution indicators • Describe classes of the most important chemicals (both organic and inorganic) that are hazardous/dangerous for human and animal health, and the environment. • Environmental Toxicity & their damaging effects.	
6.	**Credit Value**	(3L+1T)=4	
7.	**Total Marks**	**Internal Marks: 20** **External Marks: 80**	**Min Passing Marks:36**

Part B: Content of the Course		
Unit	**Topics**	Total Hours
I	**Introduction to green chemistry**: Green chemistry-relevance and goals, Anastas' twelve principles of green chemistry ,Tools of green chemistry: alternative starting materials, reagents, catalysts, solvents and processes with suitable examples.	12
II	**Microwavemediated organic synthesis (MACS), Ionic liquids:-** 1.Microwave activation - Advantage of microwave exposure, specific effects o microwave, solid supports reactions, Functional group transformations condensationsreactions, oxidations - reductions reactions, multi-componer reactions. 2. Ionic liquids and PTC Introduction:- synthesis of ionic liquids, physicalproperties, applications in alkylation,hydroformylations,synthesis of ethers,Friedel- craft reactions, Diels-Alder reactions,Knoevengalcondensations, Wittig reactions.	12

III	**Supported catalysts and bio-catalysts for Green Chemistry Tools of Green Chemistry** 1.Introduction -The concept of atom economy, supported metal catalysts, the use of Biocatalysts for green chemistry, fine chemicals by microbial fermentations, Baker's yeast mediated biotransformation, Bio-catalyst mediated Baeyer-Villiger reactions. 2.Tools of Green Chemistry Alternative synthesis, reagents and reaction conditions: A photochemical alternative to Friedel-crafts reactions, Dimethyl carbonate as a methylationagent, the design and applications of green oxidant,super critical carbon dioxide for synthetic chemistry.	12
IV	**Aquatic Chemistry and Water Pollution:**Redox chemistry in natural waters. Dissolved oxygen, Biological oxygen demand, Chemical oxygen demand, Determination of DO. BOD and COD. Aerobic and anaerobic reactions of organic Sulphur and nitrogen compounds in water, acid-base chemistry of fresh water and sea water. Aluminum, nitrate and fluoride in water. Sources of water pollution. Treatment of waste water and sewage. Purification of drinking water, techniques of purification and disinfection.	12
V	**Environmental Toxicology** **Toxic Heavy Metals** -Mercury, lead, arsenic and cadmium. Causes of toxicity. Bioaccumulation, sources of heavy metals. Chemical speciation of Hg, Pb, As and Cd. Biochemical and damaging effects. **Toxic Organic Compounds** -Pesticides, classification, properties and uses of organochlorine and organophosphorus pesticides, detection and damaging effects. **Polychlorinated Biphenyls** -Properties, uses and environmental contamination and effects. **Polynuclear Aromatic Hydrocarbons** -Sources, structures and as pollutants.	12

Part C - **Learning Resource**

Books Suggested:

1. Green Chemistry - Environmentally benign reactions, V. K. Ahluwalia. Ane Books India (Publisher). (2006).
2. Green Chemistry - Designing Chemistry for the Environment -edited by Paul T. Anastas& Tracy C. Williamson. Second Edition, (1998).
3. Green Chemistry - Frontiers in benign chemical synthesis and processes- edited by Paul T. Anastas& Tracy C. Williamson. Oxford University Press, (1998).
4. Green Chemistry - Environment friendly alternatives- edited by RashmiSanghi& M. M. Srivastava, Narora Publishing House, (2003).

5. Environmental Chemistry. Colin Baird, W.H. Freeman Co. New York. 1098.
6. Chemistry of Atmospheres. R.P. Wayne. Oxford.
7. Environment Chemistry, A.K. De, Wiley Eastern, 2004.
8. Environmental Chemistry, S.E. Manahan, Lewis Publishers.
9. Introduction to Atmospheric Chemistry, P.V. Hobbs, Cambridge,

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

Part A: Introduction			
Program: M.Sc. Chemistry	Semester: IV		w.e.f.: 2024-2025
1.	Course Code	CHEMT403	
2.	Course Title	Analytical Chemistry	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	As per Rules of Atal Bihari Vajpayee Vishwavidyalaya Bilaspur	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • How to collect sample and analyze. • Uderstand various chromatographic Techniques • Under stand result analysis • Undertand ion exchange chromatography • Undesrstand food packaging and food analysis. • Learn skill of water &food analysis	
6.	**Credit Value**	**(3L+1T)=4**	
7.	**Total Marks**	**Internal Marks: 20** **External Marks: 80**	**Min Passing Marks:36**

Part B: Content of the Course		
Unit	**Topics**	Total Hours
I	1.1 Sampling: Definition, types of sample, sampling plan, quality of sample, subsampling, Sampling of raw materials, intermediates and finished products. Sample preparations – dissolution technology and decomposition, storage of samples. Pre-treatment of samples: soil, food and cosmetics. 1.2 Selection of the Method: sources of methods, factors to consider when selecting a method, performance criteria for methods used, reasons for incorrect analytical results, method validation, and quality by design (PAT).	12
II	2.1 Measurement of uncertainty: Definition and evaluation of uncertainty, putt uncertainty to use, interpretation of results and improving the quality of results. Signal to noise: Signal to noise ratio, sources of noise in instrumental analysis. Sig to noise enhancement, hardware devices for noise reduction, software methods noise reduction. 2.3 Pharmaceutical Legislation: introduction to drug acts, drug ru (schedules), concept of regulatory affairs in pharmaceuticals, review of GLP and G and their regulations for analytical labs, roles and responsibilities of personr appropriate design and placement of laboratory equipment, requirements maintenance and calibration.	12
III	3.1 Ion exchange chromatography: Ion exchange equilibria, breakthrough capacity, inorganic ion exchangers, synthetic ion exchangers, chelating resins and their applications for separation of inorganic and organic compounds. 3.2 Ion chromatography: Principle, instrumentation with special reference to separation and suppressor columns, applications. 3.3 Exclusion chromatography : Theory, instrumentation and applications of gel permeation chromatography, retention behavior, inorganic molecular sieves, 3.1 Ion exchange chromatography: Ion exchange equilibria, breakthrough capacity, inorganic ion exchangers, synthetic ion exchangers, chelating resins and their applications for separation of inorganic and	12

	organic compounds. 3.2 Ion chromatography: Principle, instrumentation with special reference to separation and suppressor columns, applications. 3.3 Exclusion chromatography : Theory, instrumentation and applications of gel permeation chromatography, retention behavior, inorganic molecular sieves, determination of molecular weight of polymers,	
IV	Analysis of WaterPollution: Origin of waste water,types, waterpollutants andtheireffects.Sources of waterpollution domestic, industrial, agricultural soil and radioactive wastes as sources of pollution. Objective of analysis, parameter for analysis - color, turbidity. total solids, conductivity acidity, alkalinity, hardness, chloride, sulphate, fluoride, silica phosphates and different forms ofnitrogen.Heavy metalpollution- public health significance of cadmium, chromium, copper, lead, zinc, manganese, mercury and arsenic General survey of instrumental technique for the analysis of heavy metal in aqueous systems.	12
V	Food packaging – Introduction, types of packing materials, properties and industrial requirements. 4.1. 2 Processing and Quality requirements of Milk and milk products (cheese, butter and ice cream), vegetables and fruits, meat and meat products. 4.2 Analysis of Milk – Fat content, proteins, acidity, bacteriological quality and milk adulterants. 4.3 Analysis of Oils and Fats – acid value, sap value, iodine value. Determination of rancidity and antioxidants. 4.4 Analysis of spices (cloves, cinnamon, pepper, mustard) Determination of volatile oils and fixed oils.	12

Part C - **Learning Resource**

Books Suggested: 1. General, organic and biological chemistry, H. Stephen Stoker, Cengage Learning.

2. Advance dairy chemistry, vol 3, P. F. Fox, P. L. H. McSweeney Springer.

3. Physiological fluid dynamics vol 3,
NanjanagudVenkatanarayanasastryChandrasekharaSwamyNarosa Pub. House, 1992

4. Molecular Biological and Immunological Techniques and Applications for food, edited by Bert Popping, Carmen Diaz-Amigo, KatrinHoenicke, John Wiley & sons.

5. Food Analysis: Theory and practice, YeshajahuPomeranz, Clifton E. Meloan, Springer.

6. Principles of package development, Gribbin et al

7. Modern packaging Encyclopedia and planning guide, MacgraWreyco.

8. Food Analysis, Edited by S. Suzanne Nielsen, Springer

9. Analytical Biochemistry, D, J. Homes and H. Peck, Longman (1983)

10. Bioanalytical Chemistry, S. R. Mikkelesen and E. Corton, John Wiley and sons 2004

11. Analytical Chemistry, G. D. Christian, 4th Ed. John Wiley, New York (1986)

12. Fundamentals of Analytical Chemistry, D .A. Skoog and D. M. West and F. J. Holler Holt-Saunders 6th Edition (1992)

13. Principles of Instrumental Analysis, D. A. Skoog, F. J. Holler and J.A. Niemann, 5 th Edition (1998)

14. Instrumental Methods of Analysis, H. H. Willard, L. L. Merritt, Jr. J. A. Dean and F. A. Settle Jr 6 th Ed CBS (1986)

15. Instrumental Methods of Analysis, H. H. Willard, L. L. Merritt Jr, J. A. Dean and F. A. Settle Jr 7 th Ed CBS (1986)

16. Introduction to Instrumental Analysis, R. D. Braun, McGraw Hill (1987) 7.
17.Electrochemical Methods, A. J. Bard and L.R. Faulkner, John Wiley, New York,

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

Part A: Introduction			
Program: M.Sc. Chemistry	Semester: IV		w.e.f.: 2024-2025
1.	Course Code	CHEMT405	
2.	Course Title	**Supramolecular Chemistry**	
3.	Course Type	**Theory**	
4.	Pre-requisite (if any)	**As per Rules of Atal Bihari Vajpayee Vishwavidyalaya Bilaspur**	
5.	Course Learning Outcomes (CLO)	**At the end of this course, the students will be able to:** • Non-covalent interactions • Molecular receptors (e.g. for cations, anions and neutral molecules) • Supramolecular building blocks • Applications of supramolecular chemistry for molecular diagnostics, material science and medicinal chemistry • Synthetic methods in supramolecular chemistry • Objective questions practice	
6.	**Credit Value**	**(3L+1T)=04**	
7.	**Total Marks**	**Internal Marks: 20** **External Marks: 80**	**Min Passing Marks:36**

Part B: Content of the Course		
Unit	**Topics**	**Total Hours**
I.	Concepts of Supramolecular Chemistry: Definition, Nature of Supramolecular interactions, Host –guest interaction, Molecularrecognition, Types of recognition, Self-assembly.	12
II.	Cation-binding Hosts: Concepts, Cation receptors, Crown ethers, Cryptands, Spherands, Calixarens, Selectivity of cationcomplexation, Macrocyclic and template effects.	12
III.	Binding of Anions and Neutral molecules: Concepts, Anion host design, Anion receptors, Shape and selectivity, Neutral receptors, clathrates, cavitands, cyclodextrins, cyclophanes	12

IV.	Applications of Supramolecular Chemistry: Rational Design, Molecular Paneling, Supramolecular reactivity and catalysis, Supramolecular devices, Nanoscience applications.	12
V.	Supramolecular Chemistry in Biology: Membranes, Macrocyclic systems, Photosynthesis, Oxygen transport, Biological mimics, Enzymes, Metallobiosites, Heme analogues.	12

Part C - **Learning Resource**

Recommended Books:

1.J. M. Lehn, Supramolecular Chemistry, Concepts and Perspectives, VCH, 1995.
2. H. Dodziuk, Introduction to Supramolecular Chemistry, Kluwer Academic,2002.
3.F. Vogtle, Supramolecular Chemistry, An. Introduction, John Wiley & Sons, 1991.
4.J. W. Steed, J. L. Atwood, Supramolecular Chemistry, A Concise Introduction, John. Wiley, 2000
5.A. Bianchi, K. B. James, E. G. Espana, Supramolecular Chemistry of Anions, Wiley-VCH 1997.
6.M. Fujita, Molecular Self-assembly, Organic Versus Inorganic Approaches, Springer, 2000.
7.J. L. Atwood, J. E. D. Davies, D. D. MacNicol, F. Vogtle, J. M. Lehn, Comprehensive Supra Molecular Chemistry, Pergamon, 1996.

E Resources_:-**https://www.goodreads.com/book/show/16948267-organotransition-metal-chemistry**

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

Part A: Introduction			
Program: M.Sc. Chemistry		Semester: IV	w.e.f.: 2024-2025
1.	Course Code	**CHEMT406**	
2.	Course Title	**Chemistry of Natural Product**	
3.	Course Type	**Theory**	
4.	Pre-requisite (if any)	**As per Rules of Atal Bihari Vajpayee Vishwavidyalaya Bilaspur**	
5.	Course Learning. Outcomes (CLO)	**At the end of this course, the students will be able to:** • Learn the different types of alkaloids, glycosides &terpenesetc and their chemistry and medicinal importance. • Explain the importance of natural compounds as lead molecules for new drug discovery. • Learn the constituent present in crude drugs responsible for anti-diabetic activity • Discuss rDNA technology tool for new drug discovery. • Explain vitamins Chemistry and Physiological significance of Vitamin • Elaborate general methods of structural elucidation of compounds of natural origin. • Learn advanced methods of structural elucidation of compounds of natural origin. • Understand isolation, purification and characterization of simple chemical.	
6.	**Credit Value**	**(3L+1T)=04**	
7.	**Total Marks**	**Internal Marks: 20** **External Marks: 80**	**Min Passing Marks:36**

Part B: Content of the Course		
Unit	**Topics**	**Total Hours**
I.	**Terpenoids**-Classification, nomenclature, occurrence, isolation, general methods of structure determination, Isoprene Rule, Structure determination, stereochemistry, biosynthesis and synthesis of Citral, Geraniol, a-Terpeneol, Menthol, Camphor, a-pinene,Santonin,Zingibarene, Phytol, abietic acid.	12
II.	**Alkaloids**-Definition, nomenclature occurrence, Extraction and, , isolation, physiological action general method of structure, elucidation, degradation, classification based on nitrogen heterocyclic ring.Role of alkaloids in plants. Structure elucidation, stereochemistry, synthesis and biosynthesis of Ephedrine (+)- coniine, Nicotine, Atropine, Quinine and morphine	12
III.	**Steroids and Hormones**-Occurrence, Nomenclature, Basic skeleton, Diels-Hydrocarbon and stereochemistry. Isolation, structure determination and synthesis of cholesterol, bile acids, Androsterone, Testosterone, Ergosterol, Sigmasterol, Oestrone, Progesterone, Aldosterone. Occurrence, nomenclature, and general methods of structure	12

	determination. Isolation and synthesis of Bixin, Quercetin. Daidzein.Cyanin, Pelargonin chloride.Hirustidin. Biosynthesis of flavonoids, Acetate pathway and shikimic acid pathway.	
IV.	**Plan pigment**- Occurrence, nomenclature, and general methods of structure determination. Of Flavones and Flavonol Isolation and synthesis of Bixin, Quercetin. Daidzein.Cyanin, Pelargonin chloride.Hirustidin. Biosynthesis of flavonoids, Acetate pathway and shikimic acid pathway. Structure and Synthesis of anthocyanidins	12
V.	(a) Porphyrins& Carotenoids-Structure and synthesis of Haemoglobin and chlorophyll, spectral properties of porphyrins.Biosynthesis of Porphyrin, Phthalocynis.B-carotene and its relation with Vitamin A. Y carotene	12

Part C - **Learning Resource**

, Recommended Books:

Book Suggested-

1. Natural Products: Chemistry and Biological Significance, J. Mann, R. S. Davidson, J.B. Hobbs, D.V. Banthrope and J.B. Harborne, Longman, Essesx.O
2. Organic Chemistry, Vol 2, I. L. Finar, ELBS.
3. Stereoselective Synthesis: A Practical Approach, M. Nogradi, VCH.
4. Rodd's Chemistry of Carbon Compounds, Ed.S. Coffey, Elsevier.
5. Chemistry, Biological and Pharmacological Properties of Medicinal Plants from the Americas, Ed. Kurt Hostettmann, M.P. Gupta and A. Marston, Harwood Academic publishers.
6. Introduction to Flavonoids, B.A. Bohm, Harwood Academic publishers
7. New Tredns in Natural Product Chemistry, atta-urRahman and M.I. Choudhary, Harwood Academic Publishers.

Incocticides of Natural Origin, SukkDev, Harwood Academic publishers.

E Resources :-**https://www.goodreads.com/book/show/16948267-organotransition-metal-chemistry**

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

Part A: Introduction			
Program: M.Sc. Chemistry	Semester: IV		w.e.f.: 2024-2025
1.	Course Code	**CHEMT407**	
2.	Course Title	**Computational Chemistry,**	
3.	Course Type	**Theory**	
4.	Pre-requisite (if any)	As per rules of Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur	
5.	Course Learning. Outcomes(CLO)	**At the end of this course, the students will be able to learn about:** • Students will develop computational chemistry literacy. This comprises the ability to understand general contents and critically evaluate quality and applicability of computational chemistry methods and results in the scientific literature •Performance of simple computational experiments in energy evaluation, transition state modeling, conformational analysis. • Skill development to design, perform and analyze chemistry problems using computational tools.	
6.	**Credit Value**	**(3L +1T) = 04**	
7.	**Total Marks**	**Internal Marks: 20** **External Marks: 80**	**Min Passing Marks:36**

Part B: Content of the Course		
Unit	**Topics**	**Total Hours**
I.	**Introduction** and scope of computational chemistry and its tools ,potential energy surface, conformational search, molecular mechanics (MM) global minimum, local minima, saddle points	12hrs.
II.	**Many Electron atoms:** Electron correlation, addition of angular momentum, Clebesch-Gordan series, total angular momentum and spin-orbit interaction.	12 hrs.
III.	**Ab Initio Methods:** Review of molecular structure calculations, Hartree-Fock SCF method for molecules, Roothaan-Hartree-Fock method, selection of basis sets and its classification, Slater type and Gaussian type basis sets, minimal basis set, Pople style basis sets	12 hrs.
IV.	**Electron Correlation and Basis Sets:** Configuration Interaction, Multi-Configuration Self- Consistent Field, Multi-Reference Configuration Interaction, Many-Body Perturbation Theory, Coupled Cluster, Basis sets	12 hrs.
V.	**DFT and Force Fields method:** Energy as a functional of charge density, Kohn-Sham equations. Molecular mechanics methods, minimization methods, QSAR.	12 hrs.

Part C - Learning Resource
References:- 1. F. Jensen, Introduction to computational chemistry, Wiley, NY, 2007. 2. D. C. Young, Computational Chemistry, John-Wiley and Sons, NY, 2001. 3. C. J. Cramer, Essentials of Computational Chemistry, John-Wiley & Sons, 2004. 4. U. Burkert and N.L. Allinger: Molecular Mechanics, ACS Monograph, American Chemical Society, 1977. 5. Albright, Burdett and Whanghbo, Approximate Molecular Orbital Theory, Academic Press, 1985. 6. MOPAC 6.0 Manual and computer program, QCPE Ed. 7. PCMODEL Manual and Computer program, Serena Software. **E-Resources-** **https://www.goodreads.com/book/show/16948267-organotransition-metal-chemistry**

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

M.Sc. IV SEMESTER			
Part-A: Introduction			
Program: Certificate Course		Session-2024-25	
1.	Course Code	**CHEMP401**	
2.	Course Title	LAB-7 **Dissertation**	
3.	Course Type	**Laboratory Course**	
4.	Pre-requisite (if any)	As per Atal Bihari Vajpayee Vishwavidyalaya Rules	
5.	Course Learning Outcome(CLO)	• At the end of this course, the students will be able to learn the following aspects of Chemistry through practical exercises • Gain advanced abilities that can be applied to a range of careers • Use their degree to specialize in a nutritional science, environmental science or as a scientist	
6.	Credit Value	02	
7.	Total Marks	Max. Marks:100	Min.-36

Part-B: Content of Course	
Topics to be given by subject teacher related to Case study, Local Industry, Entrepreneurship etc.	
	Tap water purification
	Environmental nanotoxicology
	Materials in relation to thermoelectricity
	Science facts behind allergies
	Fertilizers and pesticides
	Environmentally-friendly materials
	Environmental pollution with chemicals
	Detection of heavy metal in plants and water
	Air pollution measurements
	Optimizing indoor plants life through chemistry
	Water purification systems
	Chemical applications to human health

	Thermal effects of various chemical reactions
	Study On Solubility and Dissolution of some Drug
	Chemical applications in industries
	The Side Effects of Insecticides and Pesticides on Our Health
	Assessment of water quality, Toxicity and treatment Strategies
	Chemical industries: evolution and developments
	Adverse Effects of Fast Food on Your Health
	Adverse child health impacts resulting from food adulteration
	Food Adulteration and Consumer Awareness
	Food Adulteration Analysis
	Modern Analytical methods for the detection of Food Fraud and Adulteration by Food Category
	Determination of Vitamins in Fresh Food and Vegetables
Total Marks-100	

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	1.6.23
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

M.Sc. IV SEMESTER			
Part-A: Introduction			
Program: Certificate Course		Session-2024-25	
1.	Course Code	**CHEMP402**	
2.	Course Title	**LAB-8 Special (Inorganic Chemistry)**	
3.	Course Type	**Laboratory Course**	
4.	Pre-requisite (if any)	As per Atal Bihari VajpayeeVishwavidyalaya Rules	
5.	Course Learning Outcome(CLO)	• At the end of this course, the students will be able to learn the following aspects of Chemistry through practical exercises in	
6.	Credit Value	02	
7.	Total Marks	Max. Marks:100	Min.-36

Part-B: Content of Course

Note: Laboratory course with Group'B'willbe of 12 hrs-duration spread overtwo days. The examinee will have to perform'three experiments. These experiments will be 20 marks each. 20 Marks each for viva-voce and Sessional work.

Group – A: Preparation Inorganic compounds/ coordination compounds and estimations of metals: (30)

1) Preparation of acetylacetonate complexes of Co(II) and Co(III) and estimation of cobalt

2) Preparation of oxalate complexes of Fe(II) and Fe(III) and estimation of iron

3) Preparation of aluminiium(III)tris(acetylacetonate) and estimation of aluminium

4) Preparation of potassium dihydroxodioxalatotitanate(IV) and estimation of titanium

5) Preparation of $K_4[ON(SO_3)2]$ (Fremy's salt)

Note: Wherever possible IR and other spectral studies should be undertaken

Group – B: General experiments (35)

1) Analysis of soda ash by acidimetry

2) Analysis of talcum powder for Mg by complexometric titration

3) Analysis of Fe in pharmaceutical preparation (colorimetrically)

4) Analysis of borax (titrimetry)

5) Determination of the strength of commercial phosphoric acid by pH titration

6) Percentage purity of ZnOcomplexometric titration

	7) Percentage purity of Epsum Salt by complexometric titration 8) Crystal growth experiments Group – C : Ore / Alloy/ commercial sample analysis (35) 1) Analysis of Iron ore Ferro-manganese: a) Percentage moisture, b) Acid insoluble residue, c) Iron gravimetrically / Mn gravimetrically 2) Analysis of Bauxite: a) Aluminium gravimetrically 3) Analysis of Ilmenite ore 4) Analysis of Magnesite ore 5) Analysis of lime stone a) loss on ignition b) estimation of calcium (redox titration) c) calcium and magnesium by complexometrically 6) Analysis of sea shell for calcium content 7) Analysis of wood's metal 8) Analysis of leaded bronze, gun metal 9) Analysis of Brass 10) Analysis of Steel, Ni in nickel steel gravimetrically 11) Analysis of monel metal Cu gravimetrically, Ni spetrophotometrically 12) Analysis of magnalium a) Mg – volumetrically or b) Al – gravimetrically 13) Analysis of bronze

Part-C Learning Resources

Books suggested :

Reference Books:

1. G. Brauer "Handbook of Preparative Inorganic chemistry" 2nd ed., Vol. 1 and 2, Academic Press New York 1967.

2. J. Bassett, R.C. Denny, G. H. Jeffery and J. Mandham, "Vogel's Text Book of Quantitative Inorganic Analysis" 4th ed. ELBS 1985.

3. G. Marr and B. W. Rockett, "Practical Inorganic Chemistry", Van Nostrnad Reinhold

London 1972.

4. G. Pass and H. Sutcliffe, "Practical Inorganic Chemistry" 2nd Ed. Chapman and Hall 1985.

5. J. D. Woolins, "Inorganic Experiments" Wiley – VCH Verlag GmbH and Co, 2003

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

M.Sc. IV SEMESTER		
Part-A: Introduction		
Program: Certificate Course		**Session-2024-25**
1.	Course Code	**CHEMP402**
2.	Course Title	**LAB-8Special (Physical Chemistry)**
3.	Course Type	**Laboratory Course**
4.	Pre-requisite (if any)	As per Atal Bihari VajpayeeVishwavidyalaya Rules
5.	Course Learning Outcome(CLO)	At the end of this course, the students will be able to learn the following aspects of Chemistry through practical exercises in
		• Study of Kinetics of different reactions • Adsorption isotherm • Thermodynamics • Spectroscopy • Polarography • Electronics
6.	Credit Value	02
7.	Total Marks	Max. Marks:100 Min.-36

Part-B: Content of Course

Kinetics

1. Study of kinetics of exchange between ethyl iodide and the iodide ion.
2. Determination of the solubility product oflead iodide.
3. Determination of-the dissociation constantof barium nitrate.
4. Determination of relative strength of the acids by-studying the hydrolysis of an ester.
5. Study the hydrolysis of methyl acetate catalysed by HCI and equimolar ureahydrochloride and hence the degree of hydrolysis of the salt.
6. Investigate the inversion of cane sugar in presence of anacid. Determine also the energyof activation of the reaction.
7. Study in inversionofcane sugar inpresence of HCL and H_2SO_4.and.hence determine therelative strength of the acids
8. Study the kinetics of hydrolysis of ethyl acetate by NaOH at two temperatures by conductance measurement, hence the energyof activation of the reaction.
9. Study the kineties of hydrolysis of tertiary amyl iodide, and determine the order and energy of activation of reaction.
10. Investigate thereaction between H_2O_2 and HI.
11. Study the kinetics of decomposition of benzene diazonium chloride at different temperatures.
12. Study the kinetics of reaction between $K_2S_2O_8$ and KI.

(a) Determine the rate constant and Order of reaction

	(b) Study the influence of ionic strength on the rate constant 13 study the kinetics of the autocatalytic reaction between KMno4 and Oxalic acid. 14. Determination of order of reaction between Bromic acid and hydrobromic acid. 15. Determination of concentration of iodine in given KI solution by isotope dilution technique 16. Determination of effect of- (a) Change of temperature. (b) Change of concentration. (c) Ionic strength of the media on the velocity constant of hydrolysis of an ester. 17. Determination of the primary salt effect on the kinetics of the kinetics of the ionic reaction and testing of the Bronsted relationship (iodide ion is oxidised by persulphate ion.) 18. Investigate the adsorption of oxalic acid from aqueous Solution by activated charcoal and verify FreundlichLangmuir's adsorption isotherm. 19. Determine adsorption isotherms of acetic acid from aqueous solution by charcoal
	Thermodynamics (i) Determination of partial molar volume of solute (e.9., KCI) and solvent in a binary Mixture. (ii) Determination of the temperature dependence of the solubility of a compound in Two solvents having similar intermolecular, interactions (benzoic acid in water and inDMSO- water mixture) and calculate the partial molar heat of solution.
	Spectroscopy (i) Determination of pKa of an indicator, (e.g., methyl red) in (a) aqueous and (b) micellar media. (ii) Determination of stoichiometry and stability constant of inorganic (e.g. ferric – salicylic acid) and organic (e.g. amine-iodine) complexes. (iii) Characterization of the complex by electronic and lR spectral data
	Polarography (i) Estimation of Pb^{2+} and Cd^{2+},Zn and Ni^{2+} ion in a mixture of Pb^{2+}lZh^{+} and $Ni^{2+}$by Polarography. (ii) Determination of dissolved oxygen in aqueous solution of Organic solvents.
	This lab course will have theory as well as practical and 'the lectures shall be delivered during lab hours.

	Distribution of Marks- Duration 6 hours **1-ANY ONE EXPERIMENT-60Marks(70Marks for ex student)** **2- VIVA VOCE-20 Marks(30 Marks for ex student)** **3-Sessional-20 Marks** **Total- 100 Marks**

Part-C Learning Resources

Books suggested :

1..Findlay's Practical Physical Chemistry revised B.P. Levitt, Longman2
2. Experiments in Physical Chemistry, J.C. Ghosh Brarati Bhavan
3. Experimental Physical Chemistry,'D,P. Shoemaker C.W. Garland and J.W. 'Niber, McGraw Hill Inter Science

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

M.Sc. IV SEMESTER			
Part-A: Introduction			
Program: Certificate Course		Session-2024-25	
1.	Course Code	CHEMP402	
2.	Course Title	LAB-8 Special (Organic Chemistry)	
3.	Course Type	Laboratory Course	
4.	Pre-requisite (if any)	As per Atal Bihari vajpayeevishwavidyalaya Rules	
5.	Course Learning Outcome(CLO)	At the end of this course, the students will be able to learn the following aspects of Chemistry through practical exercises in	
		• Multistep Synthesis • Qualitative Analysis • Extraction of organic Compounds from Natural Resources • Chromatography for separation & Identification • Spectroscopy for identification of organic compounds	
6.	Credit Value	02	
7.	Total Marks	Max. Marks:100	Min.-36

Part-B: Content of Course	
Note: Laboratory course with Group'B'willbe of 12 hrs-duration spread overtwo days. The examinee will have to performthree experiments. These experiments will be 20 marks each. 20 Marks each for viva-voce and Sessional work.	
	Qualitative Analysis Separation, Purification and identification of the components of a mixture of binary organiccompounds & mixture of three organic compounds. **Multi-step synthesis of Organic compounds (Three stage preparations. Preparationof pure crystalline product. By using any two following principals Conformation bymelting point determination.)-** The exercises should illustrate the use of organic reagents and may involvepurification oftheproducts by chromatographic techniques **Expt-1: Synthesis of paracetamol from benzene** Step 1: Benzene to Nitrobenzene (Nitration) Step 2: Nitrobenzene to N-phenyl hydroxylamine (reduction) Step 3: N-phenyl hydroxyl amine to p-aminophenol (Rearrangement) Step 4: p-amino phenol to p-hydroxy acetanilide/paracetomol(acetylation Using Acetyl Chloride)

Expt-2: Synthesis of o-chlorobenzoic acid from phthalic acid

Step 1: Phthalic acid to phthalic anhydride (Dehydration)

Step 2: Phthalic anhydride –phthalic amide (Amide formation)

Step 3: Phthalimide- Anthranilic acid (Hoffman's Bromamide reaction)

Step 4: Anthranilic acid -orthochloro benzoic acid

Expt-3: Synthesis of sulpha drug from acetanilide

Step 1: Acetanilide to p-acetamide benzene sulphonyl chloride (sulphonation)

Step 2: p-acetamide benzenesulphonylchloride to p-acetamide benzenesulphonamide

(s-amination)

Step 4: p-acetamide benzene sulphonamide to p-amino benzenesulphonamide(hydrolysis)

Expt-4: m-Chloro-nitrobenzene from nitrobenzene

Step 1: Nitro benzene to m-dinitro benzene (nitration)

Step 2: m-dinitrobenzene to m-nitro aniline (partial reduction)

Step 3: m-nitro aniline to m-nitrodiazoniumchloride (diazotization)

Step 4: m-nitrodiazoniumchloride to m-Chloro-nitrobenzene (Sandmeyer's reaction)

Expt-5: Synthesis of p-bromo benzanilide from benzophenone

Step 1: Benzophenone to benzophenone oxime (Addition)

Step 2: Benzophenone oxime to benzanilide (Beckman's rearrangement)

Step 3: Benzanilide to p-bromobenzanilide) (bromination)

Expt-6: Synthesis of Methyl orange from aniline

Step 1: Aniline to sulphonic acid (sulphonation)

Step 2: Sulphonic acid to Diazonium chloride (diazotization)

Step 3: Diazonium chloride to methyl orange (coupling reaction)

Expt-7: Synthesis of Acridone from Anthranilic acid

Step 1: Anthranilic acid to o-chlorobenzoic acid (Diazotisation followed by Sandmeyer's reaction)

Step 2: o-chlorobenzoic acid to N-phenyl anthranilic acid (Substitution Ulmann Reaction)

Step 3: N-phenyl anthranilic acid to acridone (Cyclisation)

Expt-8 Benzophenone- Benzopinacol- Benzpinacolone.(Photochemical reaction)
Expt-9 Benzilic acid rearrangement : Benzilic acid from benzoin, (Benzoin- Benzil-Benzilicacid)
Expt-10 Synthesis of heterocyclic compounds,

Skraup synthesis: Preparation of quinoline fromaniline,

Skraup synthesis: Preparation of 2 phenylindole from phenylhydrazine.
Expt-11-Preparationof p nitro aniline from Acetanilide
Expt-12- Preparation of p bromo aniline from Acetanilide

All the students must submit the sample and TLC for all the stages of preparation and a photo

copy must be pasted in records.

Extraction of Organic compounds from Natural sources-
1. Isolation of caffeine from tea leaves
2. Isolation of casein from milk
3. Isolation of lactose from milk
4. Isolation of nicotine dipicrate from tobacco
5. Isolation of piperine from black pepper
6. Isolation of lycopene from tomato.
7. Isolation of b-carotene from carrots.

Paper Chromatography
Separation and identification of the sugars, dyes and amino acids present in the givenmixture of sugars, dyes and amino acids by paper chromatography and determination ofRF values.

Spectroscopy:
Identification of organic compounds by the analysis of their spectral data (UV. IR. PMR,CMR& M) Spectrophotometric (UVA/IS) Estimations of
1. Amino acids
2. Proteins
3. Carbohydrates
4. Aspirin

Distribution of Marks-

Laboratory course with Group'B'willbe of 12 hrs-duration spread overtwo days. The examinee will have to performthree experiments. These experiments will be 20 marks each. 20 Marks each for viva-voce and Sessional work.

Total- 100 Marks

Part-C Learning Resources

REFERENCES:

1. Practical Organic Chemistry A.I.Vogel (Longmans)
2. Text Book of practical organic Chemistry F.G.Mann & B.C. Sanders.
3. A Manual of Practical Organic Chemistry Day Sitaramam&Govindachari
4. Organic Experiments L.F.Fieser.
5. Practical Organic Chemistry H.T.Openshaw
6. Systematic Identification of Organic Compounds, P.L.Shriner, R.C.Fuson& D.Y.Curtin.
7. Identification of Organic Compounds N.D.Cheronis& J.B.Entrilkin
8. Advanced Organic Synthesis by R.S.Monson Academic Press

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

Part A: Introduction			
Program: M.Sc. Chemistry		Semester: III	w.e.f.: 2024-2025
1.	Course Code	CHEMT301	
2.	Course Title	Application of Spectroscopy	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	As per Rules of Atal Bihari Vajpayee Vishwavidyalaya Bilaspur	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand shapes of molecules and bonding • Understand about ESR spectroscopy • Clear concept of UV-Vis spectroscopy • Fundamentals of NMR spectroscopy • Learn mass spectroscopy and C13 spectroscopy	
6.	Credit Value	(3L+1T)=04	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	**Vibrational Spectroscopy:** Symmetry and shape of {AB2,.AB3,AB4;ABs; AB6 mode of , " bonding of ambidentate ligands, ethylenediamine and Diketonato'complexes, application of resonance Raman spectroscopy particularly metallo-protiens : Electron Spin Resonance spectroscopy: Hyperfine coupling, spin polarization for atoms and transition metal ions, spin-orbit coupling and significance of g-tensors, application to tran'sition metal complexes (having one, unpaired electron) including biological systems and to inorganic free radicals. Nuclear Magnetic Resonance of Paramagnetic substances in solution: Factors affecting nuclear relaxation, some applications including biological systems, an overview of NMR of metal nuclides with emphasis 195Pt ahd 119Sn NMR.	12
II.	**ORGANIC CHEMISTRY** Ultraviolet and Visible Spectroscopy: Instrumentation and sample handling various electronic transition (185-800 nm) Beers-Lambert law, effect of solvent on electronic transitions, ultra-violet bands for carbonyl compounds, dienes, conjugated Polyenes, Fieser- Woodward rule for conjugated dienes and carbonyl compounds, ultra-violet spectra of aromatic and Heterocyclic compounds, steric effect in biphenyls. Infra-Red Spectroscopy: Instrumentation and Sample Handing characteristic, vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohol, ethers, phenols and amines. Detailed study of Vibrational flequencies of carbonyl compounds (Ketones, aldehydes, esters, amides, acids, anhydrides, lactones, Lactams and conjugated carbonyl compounds), Effect of Hydrogen bonding and solvent effect on vibrational frequencies, overtones, cornbination bands and Fermi resonance FT IR. IR of gaseous, solids andpolymeric materials	12
III.	**Nuclear Magnetic Resonance Spectroscopy**: General introduction and definition, chemical shift, spin-spin interaction, Shielding mechanism, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides, mercaptol) complex, spin-spin interaction between two, three, four and five nuclei (first order spectra) vicinal coupling, stereochemistry, Hindered rotation, Karplus curve, variation of coupling constant with dihedral angle. Solvent effect, Fourier Transform Technique, Nuclear overhouser effect(NOE)	12

IV.	**Carbon-13 NMR Spectroscopy**- General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, Heteroaromatic and carbonyl carbon) coupling constants. Optical Rotatory Dispersion (ORD) and Circular Dichroism (CD) - Definition, deduction of absolute configuration, octant rule for ketone.	12
V.	**Mass Spectrometry**- Introduction, ion production-EL, CL, F.D Factors affecting fragmentation, ion analysis. Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, Mclafferty rearrangement, Nitrogen rule, Examples of mass specialfragmentation of organic compounds with respect to their structure determination	12

Part C - Learning Resource

Reference Books –

1 Modern Spectroscopy- J.NI. Hollas Hohnwiley.
2 Applied Electron Spectroscopy for Chemica[Analysis Ed. H. Windowi and F.L. Ho Willey interscience.
3 NMR, NQR, ESR and Mossbaure spectroscopy in Inorganic chemistry- R.V. parish,
4 Physical Mathod in ctremistry - R.s. Drago,'saunders college.
5. Introduction to Molecular: spectroseopy --G.IVI. Baryow, Mcgraw Hill.
6 Baqic Pr[ncipte qf Speqtpseopy,- n,:Onang,Mpgriw Hitt.
7 Theory and Application of UV Specirpsqopt H.H-. Jaffe, and M. Orchin, IBH Oxford.
8 Introduction to photoelectron spectroscopy P.K.Ghosh John Wiley.
9 Introduction to magnetic Reso-nindL. n. carringtd "nJ e.o. Maclichalan Harper & Row.
10 structutal Methqds in Inorganic chemistry, E.A.v. Ebsworth, D.w.H. Raniin andCradockELBS 11.Progress in Inorganic Chemistilr, Vol. g Ed. FA. Cotton Vol. 15 Ed. S.J. Lippard

E-Resources-
https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8Vouh mrFfuhs6rkiyTA

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

Part A: Introduction			
Program: M.Sc. Chemistry	Semester: III		w.e.f.: 2024-2025
1.	Course Code	CHEMT302	
2.	Course Title	Bio-inorganic &Bio- organic Chemistry	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	As per Rules of Atal Bihari Vajpayee Vishwavidyalaya Bilaspur	
5.	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Metal Storage Transport and Bio mineralization • Describe the structural and functional relationships, mechanisms and importance of metaloenzymes. • Understand metal nucleic acids interactions & metals in medicines. • Upon completion of this course students will be able to understand how enzyme catalyzes the reaction with outmost efficiency. • Acid-base catalysis and covalent catalysis of enzyme, strain and distortion during enzyme catalysis. • Structure and biological functions of various coenzymes, and the origin of mechanism of enzyme action.	
6.	Credit Value	(3L+1T)=4	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	**Metal Storage Transport and Bio mineralization** Ferritin, Transferring and Siderophores **Calcium in Biology** Calcium in living cells, transport and regulation, molecular aspects of intermolecular processes, extracellular binding proteins	12
II.	**Metalloenzymes** Zinc enzymes-carboxypeptidase and carbonic anhydrase. Iron enzymes-catalase, peroxidase and cytochrome P-450.Copper enzymes-superoxide dismutase. Molybdenum oxatransferase enzymes-xanthine oxidase. Coenzyme vitamin B12	12
III.	**Metal-Nucleic Acid Interactions** Metal ions and metal complex interactions, Metal complexes – nucleicacids. **Metals in Medicine** Metal deficiency and disease, toxic effects of metals, metals used for diagnosis and chemotherapy with particular reference to anticancer drugs.	12

IV.	**Introduction:**Basic considerations Proximity effects and molecular Adaptation. Enzymes Introduction and historical perspective, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Nomeclature and classification, extraction and purification. Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labeling and enzyme modification by site-directed mutagenesis. **Mechanism of Enzyme:**Action Kinetics of enzyme action, MichealisMenten and Lineweaver-Burk plots, revcersible and irreversible inhibition. Transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanism for chymotrypsin, ribonuclease, lysozyme and carboxypeptidase A.	12
V.	**Reactions Catalyzed by Enzymes and Co-Enzyme Chemistry:** Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the coupling of ATP cleavage to endergonic processes. Transfer of sulphate, addition and elimination reactions, enolic intermediates in isomerization reactions, β-cleavage and condensation, some isomerization and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation. Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Structure and biological functions of coenzyme. A, thiamine pyrophosphate, pyridoxal phosphate, NAD+ , NADP+ , FMN, FAD, lipoic acid, vitamin B12 Mechanisms of reactions catalyzed by the above cofactors.	12

Part C - Learning Resource

Reference Books -

1. .Principles of Bioinorganic Chemistry ,S.J. Lippard and J.M. Berg.,University Science Books.
2. Bioinorganic Chemistry. I. Bertini, H.B.Grey, S.J. Lippard and J.S. Valentine, University Science Books
3.Inorganic Biochemistry Vol I and II Ed.G.L. Eichhom, Elsevier
4.Progress in Inorganic Chemistry, Vol.18 Ed. J.J. Lippard Wiley
5.P.S. Kalsi, Bioorganic, Bioinorganic and Supramolecular chemistry.
Biorganic Chemistry, A Chemical Approach to Enzyme Action, Hermann Dugas and C. Penny, Springer-Verlag.
6. Understanding Enzymes, Trevor Palmer, Prentice Hall.
7. Enzyme Chemistry: Impact and Applications, Ed. Collin J. Suckling, Chapman and Hall.
8. Enzyme Mechanisms Ed, M.I.Page and A. Williams, Royal Society of Chemistry.
9. Fundamentals of Enzymes: An Introduction and Applications in Biotechnology, Michael D. Trevan, John Wiley.
10. Immobilized Enzymes: An Introduction and Applications in Biotechnology, Michael D. Trevan, John Wiley.
11. Enzymatic Reaction Mechanisms C. Walsh, W.H.Freemain.
12. Enzyme Structure and Mechanism, A Fersht. W.H.Freeman.
13. Biochemistry: The Chemical Reactions of Living Cells, D.F.Metzler, Academic Press.

E-Resources-
https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8Vouh mrFfuhs6rkiyTA

अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर–रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website :www.bilaspuruniversity.ac.in

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)
कोनी पुलिस थाना के सामने, बिलासपुर–रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009
Website :www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: M.Sc. Chemistry		Semester: III	w.e.f.: 2024-2025
1.	Course Code	CHEMT303	
2.	Course Title	NANO CHEMISTRY AND COMPUTER PROGAMMING	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	As per Rules of Atal Bihari Vajpayee Vishwavidyalaya Bilaspur	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • To provide knowledge about chemistry based nanoprocess • To design and conduct experiments relevant to nanochemistry, as well as to analyze the results • To enhance the various nanosynthesis techniques and to identify and solve problems. • To improve usage of chemistry for modernTechnology • Under stand basic of Computer .language and Programing	
6.	Credit Value	(3L+1T)=04	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	**SIZE EFFECTS ON STRUCTURE AND MORPHOLOGY OF NANOPARTICLES** Fundamental Properties - Size Effects on Structure and Morphology of Free or Supported Nanoparticles - Size and Confinement Effects - Fraction of Surface Atoms - Specific Surface Energy and Surface Stress - Effect on the Lattice Parameter - Effect on the Phonon Density of States- Nanoparticle Morphology - Equilibrium Shape of a Macroscopic Crystal – Equilibrium Shape of Nanometric Crystals - Morphology of Supported Particles UNIT	12
II.	**SUPERPLASITICITY AND REACTIVITY OF METAL NANOPARTICLE**Superplasticity – Introduction – Mechanism - Superplastic Nanostructured Materials - Industrial Applications .Reactivity of Metal Nanoparticles – Size Effects-Structural Properties - Electronic Properties - Reactivity in Chemisorption and Catalysis of Monometallic Nanoparticles – Support Effects - Alloying Effects - Effect of Surface Segregation - Geometric Effects -Electronic Effects-Preparation and Implementation in the Laboratory and in Industry.	12
III.	**FEATURES OF NANOSCALE GROWTH**Specific Features of Nanoscale Growth – Introduction - Thermodynamics of Phase TransitionsDynamics of Phase Transitions - Thermodynamics of Spinodal Decomposition - Thermodynamics of Nucleation – Growth – Size Control - Triggering the Phase Transition- Application to Solid Nanoparticles - Controlling Nucleation - Controlling Growth – Controlling Aggregation. Stability of Colloidal Dispersions - Breaking Matter into Pieces	12
IV.	**Introduction to Cornputer and computer programming in "C,,** ' Computer fundamentals; - Introduction to computer organization,operstingsystem,DOSIntroduction to UNIX and wiindow. Computer languages,principleofprogrammning Algorithm and flow charts Programming in C :- Structure of a C Programming, constants, variables,,operatorsandExpressions, data Input& output, decision	12

	making, branching and looping statements arrays,statements , well defined functions pointes structure and unions,Formatstatement. Termination statements. Branching statements such as IF of GO TOstatement. LOGICAL variables. Double precision variables. Subscripted variablesand DIMENSION. DO statement. FUNCTION and SUBROUTINE. Common and Data statement.	
V.	Programming in Chemistry and use of Computer Programmes. 1. Development of small computer codes Involving simple formulae in Chemistry such As Vander waals Equation, pH Titrations, Kinetic. Radioactive Decays. Evaluation of Lattice Energy and lonicradie secular equation (within Huckel Theory),.Elementry Structural features, such as bond lenths, bond Angle,'dihedralangles,'ete. Of molecules extracted from a database. 2. Introduction and use of computer package tMS-Word and Excel. Preparation of graph and charts.	12

Part C - Learning Resource

Reference Books –

1.C. Brechignac, P. Houdy, M. Lahmani, "Nanomaterials and Nanochemistry", Springer publication 2007.
2. Kenneth J. Klabunde, "Nanoscale materials in chemistry", Wiley Interscience Publications 2001
3. C. N. Rao, A. Muller, A. K. Cheetham ,"Nanomaterials chemistry", Wiley-VCH 2007.
4. Computer and Common Sense: - R. Hunt and J. Shelley Prentice Hall.
5. Gomputaitional::Chemistry A.C. Nonis.
6. Micro Computer QuantamMechaniscs. J.P. Kilingbeck. Adam Hilger'.
7.ComputerProgramming:infortranlVV. Rajaraman, Prentice Hall.
8. An Introduction,toDigital Computer Design, V.Rajaraman and T. RadhaKrishanan Prentice Flall.

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर–रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: M.Sc. Chemistry	Semester: III		w.e.f.: 2024-2025
1.	Course Code	CHEMT305	
2.	Course Title	Transition Metal Chemistry	
3.	Course Type	Elective II –A Theory	
4.	Pre-requisite (if any)	As per Rules of Atal Bihari Vajpayee Vishwavidyalaya Bilaspur	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • To learn Synthetic, stability and application aspects of metal-alkyls and metal-aryls. • Chemistry of metal-carbon multiple bonds. Bonding and structural aspects of Pi complexes. • Aspects of fluxionality in organometallic compounds • Role and mechanism of organometallic compounds in catalyzing organic reactions	
6.	Credit Value	(3L +1T) = 04	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36

Part B: Content of the Course		
Unit	Topics	Total Hours
UNIT.I	**Alkyls and Aryls of Transition Metals**- Types, routs of synthesis, stability and decomposition pathways. Organo-copper in organic synthesis.	12
UNIT.II	**Compounds of transition Metal-Carbon multiple bonds: -** Alkylidenes, Alkylidynes, low valentcarbenes and carbynes-Synthesis, Nature of bond, Structural characteristics, nucleophilic and electrophilic reactions on the ligands.	12
UNIT. III	**Transition Metal π Complexes:-** Transition metal complexes with unsaturated organic molecules, alkenes, alkynes, allyl, diene, dienyl,arene and trienyt complexes, preparations, properties, nature of bonding and structural features, import reactions relating to nucleophilic and electrophilic attack on ligands to organic synthesis	12
UNIT. IV	**Transition Metal Compounds with Bonds to Hydrogen:** -Transition metal compounds with bonds to hydrogen. **Fluxional Organometallic Compounds:** -Fluxionality and dynamicequilibria in compounds such as η^2 – olefin η^3-allyl and dienyl complexes.	12

UNIT. V	**Homogeneous Catalysis:**-Stoichiometric reactions for catalysis, homogeneous catalytic hydrogenation, Zeigler-Natta polymerization of olefins, catalytic reactions involving carbon monoxide such as hydrocarbonylation of olefins (oxoreaction) oxopalladation reactions, actions of C-H bond.	12

Part C – **Learning Resource**

1. Principles and Application of Organotransition Metal Chemistry. J.P. Collman, L.S. Hegsdus, J.R. Norton and R.G. Finke. University Science Books.
2. The Organometallic Chemistry of the Transition Metals. R.H. Crabtree. John Wiley.
3. Metallo-organic Chemistry. A.J. Pearson, Wiley
4. Organometallic Chemistry, R.C. Mehrotra and A. Singh, New Age International.
5. Organotransition Metal Chemistry,G.R.Chatwal,Himalaya Pub. House

E Resources :-**https://www.goodreads.com/book/show/16948267-organotransition-metal-chemistry**

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	Approved 1-8-23
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

Part A: Introduction			
Program: M.Sc. Chemistry		Semester: III	w.e.f.:2024-2025
1.	Course Code	CHEMT306	
2.	Course Title	Medicinal Chemistry	
3.	Course Type	Elective 11 B - Theory	
4.	Pre-requisite (if any)	Rules of Atal Bihari Vajpayee Vishwavidyalaya Bilaspur	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Study of important antibiotics and effectiveness • Anti-cancers chemotherapy. Recent development in cancer chemotherapy. • Cardiovascular drugs and their chemical structure presently used in the treatment of heart attacks and heart problems. • Knowledge of general anesthetics. • Effective use of CNS depressants	
6.	Credit Value	(3L +1T) = 04	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	Introduction to drug absorption, disposition, elimination using pharmacokinetics. Important pharmacokinetic parameters in defining drug disposition and in therapeutics. Mention of uses of pharmacokinetics in drug development process.	12
II.	**Antibiotics** Structure and Synthesis of penicillin G. penicillin V, ampicilln, chloramphenicol, cephalosporin, tetracycline and streptomycin.	12
III.	**Antineoplastic Agents** Introduction, cancer chemotherapy, special problems, role of alkylating agents and antimetabolites in treatment of cancer. Mention of carcinolytic antibiotics and mitotic inhibitors. Synthesis of mechlorethamine, cyclophosphamide, melphalan, uracil, mustard, and 6-mercaptopurine. Recent development in cancer chemotherapy. Hormone and natural products. Seminar	12
IV.	**Cardiovascular Drugs** Introduction and classification, cardiovascular diseases, drug inhibitors of peripheral sympathetic function central intervention of cardiovascular output Direct acting arteriolar dilators. Synthesis of	12

	amyl nitrate, sorbitrate, diltiazem, quinidine, verapamil, methyldopa, atenolol oxyprenolol.	
V.	**Psychoactive Drugs the chemotherapy of mind** Introduction and classification, neurotransmitters, CNS depressants, general anaesthetics, mode of action of hypnotics, sedatives anti-anxiety drugs, benzodiazipines, buspirone. Neurochemistry of mental diseases. Antipsychotic drugs- the neuroleptics, antidepressants, butyrophenones, serendipity and drug development, sterecochemical aspects of psychotropic drugs. Synthesis of diazepam, oxazepam, chlorazepam, alprazolam, phenytoin, ethosuximide, trimethadionebarbitrates, thiopental sodium, glutethimide. Seminar	12

Part C - **Learning Resource**

Text Books, Reference Books, E-Resources

Reference Books:-

1. Insecticides of natural origin, such derv, Harwood, academic publishers.
2. Introduction to medicinal chemistry, A gringuage, wileyvch
3. Wilson and Gisold's text book of organic medicinal and Pharmaceutical Chemistry Ed Robert F. Dorge.
4. An Introduction to Drug Design, S.S. Pandeya and J.R. Dim mock, New Age International.
5. Burger's Medicinal Chemistry and Drug Discovery, vol-1 (chapter – 9 and ch-14) Ed. M.E. Wolff, John Wiley.
6. Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw Hill.
7. The Organic Chemistry of Drug Design and Drug Action, R. B. Silverman, academic press.
8. Strategies for Organic Drug Synthesis and Design, D. lednicer, John Wiley.
9. BioPharmaceuticles& Pharmacokinetics, G. R. Chhatwal Himalaya Prakashan
10. Medicinal Chemistry - Dr. J. P. Mishra &SarikaBajpai – AnusandhanPrakashan Kanpur
11. Clinical Pharmacology - Laurence , P. N. Benet, Longman – Singapur Publication
12. Medicinal Chemistry -Alka k. Gupta , PragatiPrakashan
13. Medicinal Chemistry –AshutoshKar, New Age International.

E-Resources:
https://ccsuniversity.ac.in/bridge-library/pdf/Fundamentals-Medicinal-Chemistry-2003-By-Gareth-Thomas.pdf
https://www.chem.uzh.ch/zerbe/MedChem/MedChem1_Intro.pdf
https://content.kopykitab.com/ebooks/2018/08/20847/sample/sample_20847.pdf

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

Part A: Introduction			
Program: M.Sc. Chemistry		Semester: III	w.e.f.: 2024-2025
1.	Course Code	CHEMT307	
2.	Course Title	Advanced Quantum Chemistry,	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	As per rules of Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur	
5.	Course Learning. Outcomes(CLO)	At the end of this course, the students will be able to learn about: • Basic of Quantum Chemistry & Introduction to Molecular Structure • Approximate solution to Shrodingereqation& Electron system • The Hartree-Fock Self-Consistent Field Method • Electronic Structure of Linear Molecule • Electronic Structure of Non-linear Molecule	
6.	**Credit Value**	**(3L +1T) = 04**	
7.	**Total Marks**	**Internal Marks: 20** **External Marks: 80**	**Min Passing Marks:36**

Part B: Content of the Course		
Unit	**Topics**	**Total Hours**
I.	**Introduction:** Vector Interpretation of Wave function, Hermitian Operator, The Generalized Uncertainty principle, The quantum Mechanical Virial Theorem, Solution of harmonic oscillator (Operator approach), Second quantization (Boson and Fermion), Quantum theory of angular momentum, One electron Atom, Spin angular momentum	12
II.	**Approximate solutions to the Schrodinger equation:** The Variation method (Time independent and Time Dependent), Time independent perturbation theory (non – degenerate and degenetrate), Time dependent perturbation theory, **Electron Spin and Many - Electron Systems:** The Antisymmetry Principle, Spin angular momenta and their Operators, The Orbital Approximation (Slaterdeterminant, Pauli exclusion principle), Two electron wavefunctions.	12
III.	**The Hartree-Fock Self-Consistent Field Method:** The generation of Optimized orbitals, Koopman's Theorem (The Physical Significance of Orbital Energies), The electron correlation energy, Density matrix analysis of the Hartree-Fock Approximation, Natural orbitals, The matrix solution of the Hartree- Fock Equations (Roothaan's equations). **Introduction to Molecular Structure:** The Born - Oppenheimer Approximation, Solution of the Nuclear Equation, Molecular Hartree-Fock Calculations.	12.

IV.	**Electronic Structure of Linear Molecule:** The MO - LCAO Approximation, The Hydrogen Molecule Ion, H^{+2}, The Hydrogen molecule, Molecular Configuration - Interactions, The Valence Bond Method, Molecular Perturbation Calculations.	12
V.	**Electronic Structure of Non-linear Molecule:** The AHn molecule: Methane, Ammonia and Water, Hybrid Orbitals: The Ethylene and Benzene Molecules. **Semiempirical Molecular Orbital Methods I** - PI Electron Systems: The H"uckel Approximation for Conjugated Hydrocarbons, The Pariser-Parr-PopleMethod.Semiempirical Molecular Orbital Methods II - All valence - Electron systems: The Extended H"uckel Method, The CNDO Method.	12

Part C - Learning Resource

Text Books:

1. Elementary Quantum Chemistry by Frank L. Pilar, 2nd Edition, McGraw - Hill Publishing Company, 1990.
2. Molecular Quantum Mechanics by P. W. Atkins and R. S. Friedman, 3rd Edition, Oxford Univ. Press, 1997.

Reference Books,

1. Quantum Chemistry by D. A. McQuarrie, Oxford Univ. Press, 1983.
2. Quantum Chemistry by I. N. Levine, Allyn and Bacon Inc., 3rd Edition

E-Resources-

https://www.iitpk.com/pdf/Reaction-Mechanisms-GOC-Book.pdf

https://www.researchgate.net/profile/Br-Rajeswara-Rao/post/What-is-the-most-efficient-method-for-extraction-of-phytochemicals-from-plants/attachment/59d6460ec49f478072eae357/AS%3A273831233556481%40144229786 1959/download/Natural+Products+Chemistry-Cooper%2C+Nicola.pdf

https://www.lehigh.edu/~kjs0/carev-13.PDF

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

M.Sc. III SEMESTER			
Part-A: Introduction			
Program: M.Sc. Chemistry		Session-2024-25	
1.	Course Code	CHEMP301	
2.	Course Title	Lab5-Physical Chemistry	
3.	Course Type	Laboratory Course	
4.	Pre-requisite (if any)	As per Atal Bihari Vajpayee Vishwavidyalaya Bilaspur Rules	
5.	Course Learning Outcome(CLO)	At the end of this course, the students will be able to learn the following aspects of Chemistry through practical exercise	
		• Adsorption • Phase Equilibria • Chemical Kinetics • Conductometry • Ph&Potentiometry • Polarometry	
6.	Credit Value	02	
7.	Total Marks	Max. Marks:100	Min.-36

Part-B: Content of Course

1.Adsorption:

To study surface tension – concentration relationship for solutions (Gibbs equation).

2.Phase Equilibria:

(i) Determination of congruent composition and temperature of binary system e.g. diphenylamine – benzophenone system.

(ii) Determination of glass transition temperature of given salt e. g. $CaCl_2$conductometrically.

(iii) To construct the phase diagram for three component system e. g. chloroform, acetic acid and water.

3.Chemical Kinetics :

(i) Determination of effect of (a)change of temperatures, (b)change of concentration of reactants and catalyst and(c)ionic strength of the media on the velocity constant of hydrolysis of an ester/ ionic reactions,

(ii) Determination of the velocity constant of hydrolysis of an ester/ionic reaction in micellar media.

(iii) Determination of the rate constant for the oxidation of iodide ions by hydrogen peroxide studying the kinetics as an iodine clock reaction.

(iv) Flowing clock reaction (Ref.; Experiments in Physical Chemistry by Showrnaker).

(v) Determination of the primary salt effect on the kinetics of ionic reaction and testing of the Bornsted relationship (iodide ions oxidized by persulphate ion).

(vi) Oscillatory reaction.

4.Solutions:

(i) Determination of molecular weight of non-volatile and non-electrolyte/electrolytes by cryoscopic method and to determine the activity coefficient of an electrolyte.

(ii) Determination of the degree of dissociation of weak electrolyte and to study the deviation from ideal behaviour that occurs with a strong electrolyte.

5.Conductometry:

(i) Determination of velocity constant, Order of reaction and energy of activation for saponification of ethyl acetate by sodium hydroxide.

(ii) Determination of solubility and solubility product of sparingly soluble salts (e.g. $PbSO_4$, $BaSO_4$).

(iii) Determination of the strength of strong and weak acids in a given mixture.

(iv) To study of effect of solvent on the conductance of $AgNO_3$/ acetic acid and to determine the degree of dissociation and equilibrium constant in different solvent and in their mixtures (DMSO, DMG, dioxane, acetone, water) and to test the validity of Debye- Huckle-Onsager theory.

(v) Determination of the activity coefficient of zinc ions in the solution of 0.002 M zinc sulphate using Debye Huckel's limiting law.

6.Potentiopmetry/ pH metry:

(i) Determination of strength of halides in a mixture potentiometrially.

(ii) Determination of the valencyof mercurous ions potentiometrically.

(iii) Determination of the strength of strong acid, weak acids in a given mixture using a potentiometer/ pH meter.

(iv) Determination of temperature dependence of EMF of a cell.

(v) Determination of the formation constant of silver- ammonia complex and stoichimetery of the complex potentiometrically.

(vi) Acid -- base titration in a non-aqueous media using a pHmeter.

(vii) Determination of activity and activity coefficient of electrolytes.

(viii) Determination of the dissociation constant of acetic acid in DMSO,DMG, acetone and dioxaneby titrating in with KOH.

(ix) Determination of the dissociation constant of monobasic / dibasic acid by Albert-Serjeant method.

(x) Determination of thermodynamic constant. ΔG,ΔS and ΔH for the reaction by e.m.f. method.

$$Zn + H_2SO_4 = ZnSO_4 + H_2$$

7.POLAROMETRY:

(i) Determination of rate constant for hydrolysis / inversion of sugar a polarometry.

(ii) Enzyme kinetic – inversion of sucrose

Distribution of Marks:- (Marks of Ex students are given in paranthses

(a) One practical exercise	50 (70) marks
(b) Viva voice and manipulation	20 (30) marks
(c) Sessional	30 (….) marks
Total marks	**100 (100)**

As far as possible all the exercises as laid down in the syllabus are set. The scale of marking will be determined by examiners in accordance with the nature of exercise

Part-C Learning Resources

Books suggested :

1. Practical Physical Chemistry; A. M. James and F. F. Prichard Longman.
2. Findley`s Practical Physical Chemistry; B. P.Levitt, Longman.
3. Experimental Physical Chemistry;R. C. Das and B. Behra Tata McGraw Hill

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	1-8-23
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	

M.Sc. III SEMESTER			
Part-A: Introduction			
Program: Certificate Course		Session-2024-25	
1.	Course Code	CHEMP 302	
2.	Course Title	LAB-6 General Chemistry	
3.	Course Type	Laboratory Course	
4.	Pre-requisite (if any)	As per Atal Bihari Vajpayee Vishwavidyalaya Bilaspur Rules	
5.	Course Learning Outcome(CLO)	At the end of this course, the students will be able to learn the following aspects of Chemistry through practical exercises in	
		• Inorganic Chemistry • Organic Chemistry • Physical Chemistry • Analytical Chemistry	
6.	Credit Value	02	
7.	Total Marks	Max. Marks:100	Min.-36

Part-B: Content of Course

SECTION – A (INORGANIC CHEMISTRY)

INSTRUMENTAL METHODS AND ANALYTICAL TEFHNIQUES

1. **Spectrophotometric Determinations.**
   a. Manganese/Chromium/Vanadium in steel sample.
   b. Nickel/Molybdenum/Tungsten/Vanadium/uranium by extractive spectrophotometric method.
   c. Fluoride/Nitrite/Phosphate/Nitrate.
   d. Iron-phenanthrolinecomlex:Job's method of continuous variations.
   e. Zrconium-Alizarine red-s complex:Mole-Ratio method.
   f. Copper-Ethylene diamine complex:Slope- Ratio method.
2. **pH metry:**

   Stepwise proton-ligand and metal stability constant of complexes by Irving-Rossoti methods.
3. **Plarography:**

   Composition and stability constant of complexes.
4. **Flame Photometric Determinations:**
   a. Sodium and Potassium when present together.
   b. Lithium/Calcium/Barium/Strontium.
   c. Cadmium and magnesium in tap water.
5. **Nephelometric Determinations:**
   a. Sulphate.
   b. Phosphate.
   c. Silver.
6. **Separation and Quantitative estimation of binary and ternary Mixtures by the use of following separation techniques:-**

	i. Paper chromatography – Cd and Zn,Zn and Mg. ii. Thin-layer chromatography-separation of Ni,Mg,Co and Zn.Determination of R_f values. iii. Ion exchange. iv. Solvent extraction. v. Electrophoretic separation.
	SECTION – B (ORGANIC CHEMISTRY)
2.	**1. Quantitative organic analysis:** i. Estimation of S by Messenger's method ii Estimation of N by Kjeldahl method. iii Estimation of halogen by Fusion method. **2. Functional group estimation:** i. Estimation of aniline. ii. Estimation of amino group by acetylation method. iii.Estimation of hydroxyl group by acetylation method. iv.Estimation of carbonyl group byhydrazone formation method. **3. Chromatography:** Separation and identification of the sugarspresent in the given mixture of glucose,fructose and sucrose by paper chromatography and determination of R_f values.
	SECTION-C (PHYSICAL AND ANALYTICAL CHEMISTRY)
3.	**PHYSICAL CHIMISTRY:** **Conductometry:** i. To verify Debye Huckel and Onsager limiting law for strong electroyte. ii. To determine the degree of hydrolysis constant of NH_4 Cl/aniline hydrochloride at room temperature. iii. To determine the basicity of an organic compound iv. To determine the equivalent conductance of an electrolyte at infinite dilution and determine the dissociation constant. **Colorimetry:** i. To determine the indicator constant pk_{in} of methyl red spectrophotometrically. ii. To verify additivities of absorbances of a mixture of a coloured substance in

a solution using $KMnO_4$ and $K_2Cr_2O_7$ solution.

pH metry:

i. To determine pk of given dibasic and tribasic acid.

ii. To determine the ph of various mixture of acetic acid and Na- acetate in aqueous solution and hence determine the dissociation constant of the acid.

D. Potentionmetry:

i. Titrate ferrous ammonium sulphate against $K_2Cr_2O_7$ / $KMnO_4$ and determine the dissociation constant of the acid.

ii. To determine the ionization constant of polybasic acid.

Distribition coefficient:

i. To determine the formula of the complex formed between cupric ion and ammonia by distribution method.

ii. To determine the equilibrium constant of the following reaction.

Partial molar volume:

i. Determine the partial molar volume of NaCl in aq.Solution at room temperature.

ANALYTICAL CHEMISTRY:

1. Preparation of homo-and hetero-polyacids of Sb,V,NbTa,Cr,Mo,W etc and study their properties.
2. Determine of pH_a of weak acids by pH metric and spectrophotometric methods.
3. Determination of distribution ratio and distribution coefficient of organic and inorganic compounds.
4. Separation of organic compounds by the chromatographic techniques i.e. TLC, Paper and column.
5. Analysis of carbohydrates,aminracids,proteins etc.
6. Analysis of pharmaceutical materials preservatives,flavour, additatives etc.
7. Application of redox titration for analysis of Sn (IV),Fe(III),Cr(VI),and Mn (VII).
8. Analysis of ore, mineral, alloys.
9. Determination of equilibration constant and composition of complexes.
10. Determination of determination / polymerization constant.

	Distribution of Marks- **Laboratory course (General))will be of 08hrs duration. The examinee will have to perform three experiments (one each from Section A, B, and C).These experiments will be of 20 marks each and 20 marks will be allotted for viva-voce and 20 marks for sessional work. Total- 100 Marks**

Part-C Learning Resources

Books suggested :

1. Text book of Quantitative Analysis by A.I.Vogel.
2. Experimental Physical Chemistry by Das &Behra.
3. Practical Physical Chemistry by Alexander Findlay

Sr. No.	Chemistry, B.O.S. Chairman/Member's Name	Signature
1	Mr. L.C. Manwani Asstt. Prof., Dr. B.S. Porte Govt. College, Pendra	1-8-23
2	Dr. Smt Harsha Sharma Asstt. Prof., C.M.D. PG College, Bilaspur	
3	Dr. M.R. Agar Asstt. Prof. Govt. Agrasen College Bilha	
4	Smt. Sapna Pawar Asstt. Prof., Govt. N.P.K. College Kota	
5	Dr. Smt Seema Negi Asstt. Prof., Govt. J.M.P. College Takhatpur	
6	Dr. Neeta Gupta Asstt. Prof., Govt. E.R.R. Science College Bilaspur	