Revised - Scheme A

(1)

Chaudhary Ranbir Singh University, Jind

Scheme of Examination for the Chemistry Subject in Under Graduate Programmes

As per NEP 2020 Curriculum and Credit Framework for Undergraduate Programmes

(Multiple Entry- Exit, Internships and Choice Based Credit System LOCF) with effect from the session 2023-24 (in phased manner)

Semester	Course Type	Applicable Scheme	Course Code	Nomenclature of course	Credits			Contact hours L: Lecture P: Practical T:Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
					Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P		T	P
1	CC-1	Scheme A	B-23-CHE-101	**Chemistry-I**	4	3	1	3	2	5	20	10	50	20	100	3	3
	CC-M1	Scheme A & D	B-23-CHE-102	**Minor Chemistry-I**	2	1	1	1	2	3	10	5	20	15	50	3	3
	MDC-1	Scheme A & D	B-23-CHE-103	**Introductory Chemistry-I**	3	2	1	2	2	4	15	5	35	20	75	3	3
2	CC-2	Scheme A	B23-CHE-201	**Chemistry-II**	4	3	1	3	2	5	20	10	50	20	100	3	3
	CC-M2	Scheme A & D	B23-CHE-202	**Minor Chemistry-II**	2	1	1	1	2	3	10	5	20	15	50	3	3

	MDC-2	Scheme A & D	B-23-CHE-203	**Introductory Chemistry-II**	3	2	1	2	2	4	15	5	35	20	75	3	3
	Internship of 4 credits of 4-6 weeks duration after 2nd Semester																	
3	CC-3	Scheme A	B-23-CHE-301	**Chemistry-III**	4	3	1	3	2	5	20	10	50	20	100	3	3
	CC-M3	Scheme A & D	B-23-CHE-301	**Minor Chemistry-III**	4	3	1	3	2	5	20	10	50	20	100	3	3
	MDC-3	Scheme A & D	B23-CHE-302	**Introductory Chemistry-III**	3	2	1	2	2	4	15	5	35	20	75	3	3
4	CC-4	Scheme A	B-23-CHE-401	**Chemistry-IV**	4	3	1	3	2	5	20	10	50	20	100	3	3
	CC-M4(V)	Scheme A	**From The Available pool of Vocational courses of 4 credits of University as per NEP**		4	3	1	3	2	5	20	10	50	20	100	3	3
	Internship of 4 credits of 4-6 weeks duration after 4th Semester (if not done after second semester)																	
5	CC-5	Scheme A	B23-CHE-501	**Chemistry-V**	4	3	1	3	2	5	20	10	50	20	100	3	3
	CC-M5	Scheme A	**From The Available pool of Vocational courses of 4 credits of**		4	3	1	3	2	5	20	10	50	20	100	3	3

	(V)		**University as per NEP**															
6	CC-6	Scheme A	B23-CHE-601	**Chemistry-VI**	4	3	1	3	2	5	20	10	50	20	100	3	3	
	CC-M6	Scheme A	B23-CHE-609	**Minor Chemistry-IV**	4	3	1	3	2	5	20	10	50	20	100	3	3	
	CC-M7(V)	Scheme A	**From The Available pool of Vocational courses of 4 credits of University as per NEP**		4	3	1	3	2	5	20	10	50	20	100	3	3	

Note: Four Credits of Internship Earned By a Student during Summer Internship after 2nd Semester or 4th Semester Will Be Taken Into Account In Fifth Semester of a Student Who Pursue 3 Year UG Programme Without Taking Exit Option

Coursecomposition-Theory/Theory+Tutorial			
Course Credit	InternalAssessmentmarks	Endtermexammarks	Totalmarks
2	15	35	50
3	25	50	75
4	30	70	100

Coursecomposition-Theory+Practical					
Course Credit	Theory		Practical		Totalmarks
Theory+Practical	InternalAssessmentmarks	Endtermexammarks	InternalAssessmentmarks	Endtermexammarks	
1+1	10	20	5	15	50
2+1	15	35	5	20	75
2+2	15	35	15	35	100
3+1	20	50	10	20	100
0+4	NA	NA	30	70	100

1. Internal assessment(30%)shallbebroadlybasedonthefollowingdefinedcomponentsof;
   a. Classparticipation
   b. Seminar/Presentation/Assignment/Quiz/classtest,etc.
   c. MidTermExam

Total InternalAssessmentMarks(Theory)	Class Participation	Seminar/Presentation/Assignment/Quiz/classtest,etc.	Mid-TermExam
10	4	-	6
15	4	4	7
20	5	5	10
25	5	7	13
30	5	10	15

Total Internal Assessment Marks (Practicum)	Class Participation	Seminar/Demonstration/Viva-Voce/Lab record, etc.	Mid-Term Exam
5		5	NA
10		10	NA
15	5	10	NA
30	5	10	15

CC-M6

Session 2023-24

Part A- Introduction

Subject	Chemistry
Semester	VI
Name of Course	Minor Chemistry-IV
Course Code	B-23 CHE-609
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC /DSE/PC/AEC/VAC)	CC-M4
Level of Course (As per Annexure-I)	100-199
Pre-requisite for the course (if any)	4.0

Course Learning Outcomes (CLO):

After completing this course, the learner will be able to:

1. Understand the chemistry of d-block elements.
2. To learn about fundamentals of photochemistry and photophysical processes.
3. To understand the nature of chemical bonding, resonance, and electronic effects, and apply these concepts to predict the reactivity and orientation of aromatic compounds in electrophilic substitution reactions.
4. To understand the classification, structure, and biological roles of key biomolecules such as carbohydrates, proteins, and nucleic acids, and learn how these molecules function in living organisms
5*. Students will gain hands-on experience in classical and instrumental analytical techniques such as conductometry, potentiometry, polarimetry, organic and inorganic synthesis, and photochemical analysis.

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
Max marks: 70+30* Internal Assessment Marks: 20+10* Examination Time: 03+03* Hours End Term Exam Marks: 50+20*			

Part B- Contents of the Course

Instructions for Paper-Setter

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1) based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator is allowed.

Unit	Topics	Contact Hours
I	Chemistry of d-Block elements Definition of transition elements, General characteristic properties of d-Block elements, Comparison of ionic radii 3d, 4d and 5d series elements, magnetic properties, Stability of various oxidation states and Latimer and Frost diagrams, Structure of some compounds of transition elements- FeCl3, CuCl2 and Ni(CO)4.	12
II	Photochemistry Interaction of radiation with matter, difference between thermal and photochemical process, Law of photochemistry: Lambert-Beer Law, Grotthus-Drapper Law, Stark Einstein Law (Law of photochemical equivalence), concept of singlet and triplet states, Jablonski diagram – depicting various process occurring in excited states including fluorescence, phosphorescence and non-radiative processes (internal conversion, intersystem crossing).	11
III	Structure and Bonding Localized and delocalized chemical bond, Van der Waals interactions. Concept of resonance and its applications, hyperconjugation, inductive effect, Electromeric effect and their comparison. Benzene and its derivatives: Nomenclature, Aromatic nucleus and side chain, Huckel's rule of aromaticity. Aromatic electrophilic substitution, mechanism of nitration, halogenation and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents.	11
IV	Biomolecules Definition, classification of biomolecules, importance of biomolecules in living organisms. Carbohydrates: Classification, structure and properties of monosaccharides, disaccharides structure and bonding (lactose and sucrose). Proteins: Amino acids, structure, classification and properties, peptide bond and elementary idea of structure of proteins.	11
V*	1. To determine the strength of given acid solution (mono acid only) conductometrically.	30

	2. Identification of carbohydrates (glucose/fructose/sucrose) 3. To determine the molecular weight of organic compound by Rast method. 4. To determine the specific rotation of an optically active substance by polarimeter. 5. To prepare a sample of cuprous chloride. 6. To study the photochemical reaction of benzophenone and isopropyl alcohol. 7. To prepare m-dinitrobenzene from nitrobenzene.	
Suggested Evaluation Methods	Internal Assessment: 20+10* Theory • Class Participation: 5 • Seminar/Presentation/Assignment/Quiz/Class Test etc.: 5 • Mid Term Exam: 10 Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End Term Examination: 50+20*

Part C- Learning Resources

Recommended Books/e-resources/LMS:

1. Mukherji, Singh, Kapoor and Dass, Organic Chemistry Volume II & III, New Age International Pvt. Ltd., New Delhi.

2. Huheey, J.E.; Keiter, E.A., Keiter; R. L.; Medhi, O.K. (2009), Inorganic Chemistry Principles of Structure and Reactivity, Pearson Education.

3. Lee, J.D.; (2010), Concise Inorganic Chemistry, Wiley India.

4. Ahluwalia, V.K., Parashar, R.K. (2011), Organic Reaction Mechanisms, 4th Edition, Narosa Publishing House.

5. Horspool, W.M. (1976) Aspects of Organic Photochemistry, Academic Press.

6. Kapoor, K.L. (2015), A Textbook of Physical Chemistry, Vol 3, 6th edition, McGraw Hill Education.

7. Kuashik, S., Singh, A. (2023), Biomolecules: From Genes to Proteins, First Edition, Berlin, Boston: De Gruyter.

8. Pandey, O.P.; Bajpai, D.N.; Giri S.; A Textbook of Practical Chemistry, S. Chand & Company.

9. Furniss, S.; Hannaford, A.J.; Smith, P.W.G.; and Tatchell A.R. Vogel's Textbook of Practical Organic Chemistry (Pearson Education).

10. David L. Nelson and Michael M. Cox, Lehninger Principles of Biochemistry, W.H. Freeman and Company.

*Applicable for courses having Practical component

Remarks	Course	Paper(s)	Semester	Nomenclature of Paper	Credits	Hours /Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A,B, C & D	VOC	B23-VOC-222(A)	IV	Agriculture Chemistry	2	2	15	35	50	3 hrs.
				Practical	2	4	15	35	50	3 hrs.
Scheme A, B,C & D	VOC	B23-VOC-227(A)	IV	Green Chemistry	2	2	15	35	50	3 hrs.
				Practical	2	4	15	35	50	3 hrs.

Remarks	Course	Paper(s)	Semester	Nomenclature of Paper	Credits	Hours /Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A, B &C	VOC	B23-VOC-122(A)	V	Chemistry of Fertilizers and Pesticides	2	2	15	35	50	3 hrs.
				Practical	2	4	15	35	50	3 hrs.
Scheme A, B,C &D	VOC	B23-VOC-123(A)	V	Chemistry of Cosmetics and Perfumes	2	2	15	35	50	3 hrs.
				Practical	2	4	15	35	50	3 hrs.
Scheme A, B,C &D	VOC	B23-VOC-321(A)	VI	Green Laboratory Practices	2	2	15	35	50	3 hrs.
				Practical	2	4	15	35	50	3 hrs.

VOC			
Session:2023-24			
Part A –Introduction			
Subject	Chemistry		
Semester	V		
Name of the Course	Chemistry of Fertilizers and Pesticides (A)		
Course Code	B23-VOC-122 (A)		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	0-99		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Know about fertilizers and nutrients; 2. Understand types of nitrate fertilizers; 3. Understand types of phosphate fertilizers: 4. Get the knowledge about pesticides. 5*.Understand the issues involved in pesticides and fertilizers		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	30	60	90
Max. Marks: 50 +50* Internal Assessment Marks: 15+15* End Term Exam Marks: Theory: 35+35*		**Time: Theory: Three Hours Practicum: Three Hours**	
Part B- Contents of the Course			
Instructions for Paper-Setter Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal			

marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.

Unit	Topics	Contact Hours
I	Methods and time of fertilizer applications, tips to get best efficiency of Applied fertilizers, Integrated nutrient management, fertilizers and its relations to plant nutrients.	08 Hrs
II	Classification and types of fertilizers, Nitrogenous fertilizers: Ammonium nitrate, Urea, Sodium Nitrate, Ammonium Chloride: Introduction, Raw materials, Action of as a fertilizers.	08 Hrs
III	Phosphate fertilizers: Normal super phosphate, Triple Super Phosphate, Ammonium Phosphate.	07 Hrs
IV	Pesticides: Classification, synthesis, structure activity relationship(SAR), mode of action, uses and adverse effects of representative pesticides in the following classes: Organochlorines (DDT, Gammaxene); Organophosphates (Malathion, Parathion); Carbamates (Carbofuranand Carbaryl);	07 Hrs
V*	1. To carryout market survey of potent pesticides with details as follows: a) Name of pesticide b) Chemical name, class and structure of pesticide c) Type of formulation available and Manufacturer's name d) Useful information on label of packaging regarding: Toxicity, LD50 ("Lethal Dose, 50%"), Side effects and Antidotes. 2. To carryout market survey of potent botanical pesticides with details as follows: a) Botanical name and family; b) Chemical name (active ingredient) and structure of active ingredient; c) Type of formulation available and Manufacturer's name; d) Useful information on label of packaging regarding: Toxicity, LD50 ("Lethal Dose, 50%"), Side effects and Antidotes. 3. Preparation of simple Organo chlorine pesticides. 4. To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications. 5. To calculate active ingredient in given sample of pesticide formulations as per BIS specifications. 6. Preparation of Neem based botanical pesticides. 7. To study about identification of crops, seeds, fertilizers and pesticides. 8. To test repellent and insecticidal effects of garlic chilly extract. 9. To test repellent and insecticidal effects of *Curcuma longa* extract.	60 Hrs

Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS	
Internal Assessment: 15+15*=30 ➢ **Theory: 15** • Class Participation:04 • Seminar/presentation/assignment/quiz/class test etc.: 04 • Mid-Term Exam:07 ➢ **Practicum: 15** • Class Participation:05 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: N.A.	**End Term Examination: 35+35***

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Gopal Rao: Outlines in Chemical Technology.
2. Shukla and Pandey: Introduction to Chemical Technology
3. Perry, A. S.; Yamamoto, I.; Ishaaya, I.; Perry, R.Y. (1998), Insecticides in Agriculture and Environment, Springer-Verlag Berlin Heidelberg.
4. Kuhr, R. J.; Derough, H.W. (1976), Carbamate Insecticides: Chemistry, Biochemistry and Toxicology, CRC Press,USA.

*Applicable for courses having practical component.

Session: 2023-24			
Part A –Introduction			
Subject	Chemistry		
Semester	IV		
Name of the Course	Green Chemistry (A)		
Course Code	B23-VOC-227 (A)		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	0-99		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	• Understand the twelve principles of green chemistry and also build the basic understanding of toxicity, hazard and risk related to chemical substances. • Calculate atom economy, E-factor and relate them in all organic synthesis • Appreciate the use of catalyst over stoichiometric reagents. Learn to use green solvents, renewable feedstock and renewable energy sources for carrying out safer chemistry • Appreciate the use of green chemistry in problem solving skills and critical thinking to innovate and find solutions to environmental problems. • Learn to design safer processes, chemicals and products through understanding of inherently safer design (ISD) • Appreciate the success stories and real-world cases as motivation for them to practice green chemistry		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	30	60	90
Max. Marks: 50 +50* Internal Assessment Marks: 15+15* End Term Exam Marks: Theory: 35+35*		**Time: Theory: Three Hours Practicum: Three Hours**	
Part B- Contents of the Course			

Instructions for Paper-Setter

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks

. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1is compulsory.

Unit	Topics	Contact Hours
I	Green Chemistry: An interdisciplinary approach towards sustainable development History of emergence of Green Chemistry through some industrial disasters, environmental movements for public awareness and some important environmental laws, Definition of Green Chemistry, Need for Green Chemistry, goals of Green Chemistry, Green Chemistry advances towards a sustainable future, Green Chemistry v/s Environmental Chemistry, Green Chemistry and its interdisciplinary nature,	08 Hrs
II	Twelve Principles of Green Chemistry and their illustrations with examples. Catalysis for Green Chemistry with examples. Catalytic oxidation using H2O2, Bio-catalysis, Photocatalysis, Green reagents, Green solvents including solvent free synthesis of some organic compounds and inorganic complexes, alternative sources of energy, Green energy and sustainability.	08 Hrs
III	Wealth from waste, Industrial case studies Green Nanotechnology, Greener approaches for nanoparticle synthesis Pharmaceutical industries: The largest waste producer problems and solutions through Green Chemistry benefits of greening industries, Need for Academia-Industry collaborations, Innovations stemming from Academia-Industry collaborations Emerging Green Technologies. Green solvents, Next generation catalyst design, Microwave assisted synthesis etc.	07 Hrs
IV	The following Real-world Cases in green chemistry should be discussed: Surfactants for carbon dioxide replacing smog producing and ozone depleting solvents with CO: for precision cleaning and dry cleaning of garments. An efficient, green synthesis of a compostable and widely applicable plastic (polylactic acid) made from com.	07 Hrs

V*	A) Characterization by melting point. UV-Visible spectroscopy. IR spectroscopy and any other specific method should be done (wherever applicable). 1. Preparation and characterization of nanoparticles of gold using tea leaves silver nanoparticles using plant extracts 2. Preparation of biodiesel from waste cooking oil and characterization (TLC. pll solubility, combustion test, density, viscosity, gel formation at low temperature and IR can be provided). 3. Extraction of D-limonene from orange peel using liquid CO2 prepared from dry jce. 4. Mechano chemical solvent free, solid-solid synthesis of azomethine using p-toluidine and o-vanillin/n-vanillin. 5. Photoreduction of benzophenone to benzopinacol in the presence of sunlight. B)(1) Instrumental methods of analysis utilizing flame photometer, atomic absorption spectrophotometer, pH-meter, potentiometer, turbidity meter, electrochemical methods, separation of mixtures of metal ions by ion exchange chromatography. (2) Synthesis and thermal analysis of group II metal oxalate hydrates. (3) Any other experiments done in the class during the current academic semester.	60 Hrs

Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS

Internal Assessment: 15+15*=30 ➢ **Theory: 15** • Class Participation:04 • Seminar/presentation/assignment/quiz/class test etc.: 04 • Mid-Term Exam:07 ➢ **Practicum: 15** • Class Participation:05 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: N.A.	**End Term Examination: 35+35***

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Anastas, P.T. & Warner, J.C. Green Chemistry- Theory and Practical, Oxford University Press (1998).
2. Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker (2001).
3. Cann, M.C. & Connely, M.E. Real-World cases in Green Chemistry, American Chemical Society, Washington (2000).
4. Sharma, R.K. & Bandichhor, R. Hazardous Reagent Substitution, Royal Society of Chemistry, Green Chemistry Series (2018).
5. Ryan, M.A. & Tinnes, M. Introduction to Green Chemistry, American Chemical Society, Washington (2002).
6. Sharma, R.K., Sidhwani, I.T. & Chaudhari, M.K. Green Chemistry Experiments: A Monograph I.K. International Publishing House Pvt. Ltd. New Delhi, Bangalore ISBN 978-93-81141-55-7 (2013).
7. Lancaster, M. Green Chemistry: An Introductory Text RSC publishing, 2nd Edition ISBN 978-1-84755-873-2 (2010)

*Applicable for courses having practical component.

VOC

Session:2023-24			
Part A –Introduction			
Subject	Chemistry		
Semester	V		
Name of the Course	Chemistry of cosmetics & perfumes (A)		
Course Code	B23-VOC-123 (A)		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	0-99		
Pre-requisite for the course (if any)	--		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Get the knowledge of cosmetics; 2. Logically think regarding preparation strategies and uses of cosmetic products; 3. Understand about preparation strategies and uses of cosmetic creams; 4. Get to know about the essential oils preset in nature & their importance towards industrial uses. 5*.learn about practical hands involved in preparation of cosmetic products.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	30	60	90
Max. Marks: 50 +50* Internal Assessment Marks: 15+15* End Term Exam Marks: Theory: 35+35*		**Time: Theory: Three Hours Practicum: Three Hours**	
Part B- Contents of the Course			
Instructions for Paper- Setter			

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.

Unit	Topics	Contact Hours
I	Cosmetics-Definition, History, Classification, Ingredients, Nomenclature, A general study including preparation and uses of the following: Hair dye, Hairspray, Shampoo.	08 Hrs
II	Preparation and uses of Face powder, Lipsticks, Talcum powder, Nail enamel.	07 Hrs
III	Preparation and uses of creams (cold, vanishing, and shaving creams), Antiperspirants and Artificial flavours.	07 Hrs
IV	Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, and Sandal wood oil, Eucalyptus, Rose oil.	08 Hrs
V*	1. Preparation of Talcum powder. 2. Preparation of Shampoo. 3. Preparation of Enamels. 4. Preparation of Hair remover. 5. Preparation of Face cream. 6. Preparation of Nail polish. 7. Preparation of Nail polish remover. 8. Preparation of Hair conditioner	60 Hrs
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS		
Internal Assessment: 15+15*=30 ➢ **Theory: 15** • Class Participation:04 • Seminar/presentation/assignment/quiz/class test etc.: 04 • Mid-Term Exam:07 ➢ **Practicum: 15** • Class Participation:05 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: N.A.		**End Term Examination: 35+35***
Part C- Learning Resources		

Recommended Books/e-resources/LMS:

1. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.
2. P. C. Jain, M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
3. B. K. Sharma: *Industrial Chemistry*, Goel Publishing House, Meerut.
4. Textbook of Cosmetics; MV imaladevi; CBS Publishers & Distributors; 2015,
5. ISBN 81-239-1103-3
6. Text Book of Cosmetics; Dr Akanksha Garud, Dr PK Sharma, Dr Navneet Garud; Pragati Prakashan; 2012, ISBN 978-93-5006-691-1
7. Pharmaceutics and Cosmetics; Praveen K. Gupta, Sanjeev K. Gupta; Pragati Prakashan; 2011, ISBN 978-81-8398-995-4
8. Chemistry of Cosmetics; R. Kumari; Prestige Publisher, 2018,
9. ISBN 978-81-936512-3-0
10. Formulation Guide For Cosmetics; The Nisshin Oil lio Group, Ltd.

*Applicable for courses having practical component.

VOC

Session:2023-24			
Part A –Introduction			
Subject	Chemistry		
Semester	VI		
Name of the Course	Green laboratory practices (A)		
Course Code	B23-VOC-321 (A)		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	0-99		
Pre-requisite for the course (if any)	--		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Learn about green chemistry; 2. Describe how injudicious use of chemicals can have an adverse/potentially damaging effect on humans and the environment. 3. Propose ideas for innovative approach esto energy challenges. 4. Convert biomass into valuable chemicals through green technologies.		
	5*.Hands on training towards green chemistry		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	30	60	90
Max. Marks: 50 +50* Internal Assessment Marks: 15+15* End Term Exam Marks: Theory: 35+35*		**Time: Theory: Three Hours Practicum: Three Hours**	
Part B-Contents of the Course			
Instructions for Paper-Setter Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on			

Entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.		
Unit	**Topics**	**Contact Hours**
I	Scheme for the traditional as well as green method for the synthesis of ibuprofen. Compare the amount and hazards of waste generated in both Green Methods in Chemistry. Preparation of propene by Hoffman elimination	07 Hrs
II	Prevention/minimization of hazardous/toxic products reducing toxicity. Risk= (function) hazards exposure: (a) Nitration of salicylic acid using green method Ca(NO3)2 (b) Acetylation of primary aromatic amine using the green method. Use of Green solvents and comparison of greenness of solvents: (a) Introduction to water as a solvent for chemical reactions. Preparation of Manganese(III) Acetylacetonate using green method (b) Advantages and application of solvent less processes in organic reactions.	08 Hrs
III	Energy requirements for reactions – alternative sources of energy: use of microwaves and photochemical energy. (a) Photoreduction of benzophenone to benzopinacol in the presence of sunlight. (b) Microwave assisted ammonium formate-mediated Knoevenagel reaction: p-anisaldehyde, ethyl cyanoacetate, ammonium formate.	07 Hrs
IV	Importance of using catalytic reagents in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis. Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide	08 Hrs
V*	1. Dehydration of propanol 2. Nitration of salicylic acid using calcium nitrate 3. Photoreduction of benzophenone to benzopinacol in the	60 Hrs

	Presence of sunlight 4. Microwave assisted solvent free synthesis of aspirin 5. Synthesis of vitamin D3 using photochemical energy 6. To prepare Bio diesel from waste cooking oil.	

Suggested Evaluation Methods
Short Answer and MCQ Type QUESTIONS

Internal Assessment: 15+15*=30 ➢ **Theory: 15** • Class Participation:04 • Seminar/presentation/assignment/quiz/class test etc.: 04 • Mid-Term Exam:07 ➢ **Practicum: 15** • Class Participation:05 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: N.A.	**End Term Examination: 35+35***

Part C- Learning Resources

Recommended Books/e-resources/LMS:

Theory:

1. Anastas, P. T., Warner, J. C. (2014), Green Chemistry, Theory and Practice, Oxford University Press.
2. Lancaster, M. (2016), Green Chemistry: An Introductory Text, 3rd Ed., RSC Publishing.
3. Cann, M. C., Connely, M. E. (2000), Real-World cases in Green Chemistry, American Chemical Society, Washington.
4. Matlack, A. S.(2010), Introduction to Green Chemistry, 2nd Ed., CRC Press.
5. Alhuwalia,V. K.; Kidwai, M. R. (2012), New Trends in Green chemistry, Kluwer Academic Publishers, Springer.
6. Sidhwani, I. T; Sharma, R. K. (2020),An Introductory Text on Green Chemistry,Wiley India Pvt Ltd.
7. Etzkorn, F. A. (2019), Green Chemistry: Principles and Case Studies, Royal Society of Chemistry.

Practicals:

8. Kirchoff, M., Ryan, M. A. (2002), Greener approach esto under graduate chemistry experiment, American Chemical Society, Washington DC.
9. Sharma, R. K., Sidhwani, I. T., Chaudhari, M. K. (2013), Green Chemistry Experiments: Amonograph, I. K. International Publishing House Pvt Ltd. New Delhi.
10. Pavia, D. L., Lamponam, G. H., Kriz, G.S.W. (2006), Introduction to organic Laboratory Technique- A Microscale approach, 4th Edition, Brooks-Cole Laboratory Series for Organic chemistry.
11. Sidhwani, I.T. ; Saini, G.; Chowdhury, S. Wealth from Waste: A green method to produce biodiesel from waste cooking oil and generation of useful products from waste further generated.University ofDelhi, Journal of Undergraduate Research and Innovation,Volume1, Issue1, February 2015, ISSN: 2395-2334.
12. Sharma, R. K., Gulati, S., Mehta, S. (2012), Preparation of Gold Nanoparticles Using Tea: A Green Chemistry Experiment, Journal of Chemical Education, 89 (10), 1316-1318.

*Applicable for courses having practical component.

VOC

Session: 2023-24			
Part A – Introduction			
Subject	Chemistry		
Semester	III		
Name of the Course	Agricultural chemistry (A)		
Course Code	B23-VOC-222 (A)		
Course Type: (CC/MCC/MD C/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)	VOC		
Level of the course (As perAnnexure-I	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1 Thinks about chemistry involved in agriculture 2 Know about chemical composition of soils; 3 Understand impacts of pollutions on soils and its productivity; 4 Critically think regrading sewage effluents. 5*. Practical training of soil analysis		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	30	60	90
Max. Marks: 50 +50* Internal Assessment Marks: 15+15* End Term Exam Marks: Theory: 35+35*		**Time: Theory: Three Hours Practicum: Three Hours**	
Part B- Contents of the Course			
Instructions for Paper- Setter Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1) based onentire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selectingone from each SECTION. Question No.1 is compulsory.			

VOC

Session: 2023-24			
Part A – Introduction			
Subject	Chemistry		
Semester	III		
Name of the Course	Agricultural chemistry (A)		
Course Code	B23-VOC-222 (A)		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As perAnnexure-I	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1 Thinks about chemistry involved in agriculture 2 Know about chemical composition of soils; 3 Understand impacts of pollutions on soils and its productivity; 4 Critically think regrading sewage effluents. 5*. Practical training of soil analysis		
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Unit	Topics
I	**08 Hrs** Plants as producers: Photosynthesis, pesticides, herbicide, insecticide, fungicide, storage and preservation of agriculture produce, food processing, use of polymers in agriculture
II	**07 Hrs** Soil fertility and soil productivity: urea cycle, Organic and inorganic nitrogen (Haber Bosch Process), nutrient sources – fertilizers and manures; essential plant nutrients - functions and deficiency symptoms.
III	**07 Hrs** Chemical (elemental) composition of the earth's crust and soils, Chemistry of acid soils; active and potential acidity; lime potential, chemistry of acid soils; sub-soil acidity; soil management and amendments.
IV	**08 Hrs** Nature and sources of pollutants acid rains, oil spills etc.; air, water and soil pollutants - their CPC standards and effect on plants, animals and human beings. Sewage and industrialeffluents – their composition and effect on soil properties/health, and plant growth and human beings.
V*	**60 Hrs** 1. pH of Soil 2. determine carbonate and bicarbonate in soil 3. Determine chloride in the soil sample 4. Determine starch in organic manure 5. Determine nitrate in the soil 6. Determine sulphate in the soil 7. To study Seed germination and viability test. 8. To prepare Bio Etahnol from agricultural waste 9. Determination of the content of potassium in the soil.
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS	

Internal Assessment: 15+15*=30 ➢ **Theory: 15** • Class Participation:04 • Seminar/presentation/assignment/quiz/class test etc.: 04 • Mid-Term Exam:07 ➢ **Practicum: 15** • Class Participation:05 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: N.A.	**End Term Examination: 35+35***

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- ✓ Bear RE. 1964. Chemistry of the Soil. Oxford and IBH. Bolt GH & Bruggenwert MGM. 1978. Soil Chemistry. Elsevier. Greenland DJ & Hayes MHB. 1981. Chemistry of Soil Processes. John Wiley & Sons.
- ✓ Brady NC & Weil RR. 2002. The Nature and Properties of Soils. 13 Ed. Pearson Edu.
- ✓ Kabata-Pendias A & Pendias H. 1992. Trace Elements in Soils and Plants. CRC Press.
- ✓ Kannaiyan S, Kumar K & Govindarajan K. 2004. Biofertilizers Technology. Scientific Publ.
- ✓ Leigh JG. 2002. Nitrogen Fixation at the Millennium. Elsevier.
- ✓ Mengel K & Kirkby EA. 1982. Principles of Plant Nutrition. International Potash Institute, Switzerland.
- ✓ Mortvedt JJ, Shuman LM, Cox FR & Welch RM. 1991. Micronutrients in Agriculture. 2 Ed. SSSA, Madison.
- ✓ Pierzinsky GM, Sims TJ & Vance JF. 2002. Soils and Environmental Quality. 2 Ed. CRC Press.
- ✓ Stevenson FJ & Cole MA. 1999. Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulphur,Micronutrients. John Wiley & Sons.
- ✓ Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. Soil Fertility and the Fertilizers. 5 Ed.Prentice Hall of India.
- ✓ Troeh FR & Thompson LM. 2005. Soils and Soil Fertility. Blackwell.