Department of Chemistry

PROGRAMME OUTCOME AND COURSES OUTCOME

The Programme Outcome of B.Sc. Honours in Chemistry:

Upon successful completion of the six-semester Honours chemistry core course, a student should be able to achieve the following significant program outcomes, **which are mentioned point by point as follows:**
1. Demonstration, solution, and understanding of vital major concepts in Organic/Inorganic/Physical/Analytical/Green/Environmental chemistry disciplines.

2. Solve the problem, think methodically independently, and draw a logical conclusion about the subject chemistry.

3. Use critical thinking and scientific knowledge to design, perform, record, and analyze the results of chemical reactions.

4. Create awareness of the impact of chemistry on the environment, society, and development outside of the scientific community.

5. Find out the green way for chemical reactions for sustainable development.

6. To inculcate scientific temperament in students and outside the scientific community.

7. Use modern scientific techniques and gain various equipment's adequate knowledge in future research work and chemical software.

Aside from usual program outcomes, students of the chemistry branch must gain specific program outcomes mentioned below:

1. Students gain knowledge of chemistry through theory and practical experiments.

2. Students explain nomenclature, stereochemistry, structures, reactivity, and mechanism of chemical reactions.

3. Identify chemical formulas and solve numerical problems.

4. Students understand the basic principles of organic, inorganic, physical, and analytical chemistry, and their applications through various laboratory experiments.

5. Students use the necessary modern chemical tools, models, chem-draw software, charts, and equipment.

6. Thoroughly understand good laboratory practices and knowledge of safety.

7. Readily develop research-oriented skills.

8. The students know and handle sophisticated instruments/equipment.

9. Students' research knowledge developed. 10. Students are motivated to enter multidisciplinary branch research work.

The course Outcome of B.Sc. Honours in Chemistry:

Sl. No.	SEM 1 COURSES		
		Brief of the Course	**Outcome of the Course**
1	CC 1	**Organic Chemistry-I:** Basics of Organic Chemistry, Bonding and Physical Properties, General Treatment of Reaction Mechanism I, Stereochemistry I	On completion of this course, the students will be able to understand the physical properties of organic molecules that are used observe and describe matter, or to separate the substances in a mixture. The concept of orbital picture and MO theory of organic molecules help to understanding the stereochemistry of pericyclic reactions. Students will be able to understand various types of reaction intermediates and factors affecting their stability. They also recognize and draw constitutional isomers, stereoisomers including enantiomers and diastereoisomers, racemic mixtures, meso compounds and R/S nomenclature of chiral molecules.
2	CC 2	**Physical Chemistry-I:** Kinetic Theory and Gaseous state, Chemical Thermodynamics, Chemical kinetic.	From the study of gases, the students will come to know to calculate various physical parameters of gases and how to liquify gases. From the study of thermodynamics will come to learn about the feasibility of reactions and also calculate various thermodynamic properties of system. Of these properties heat of reaction, flash point, heat combustion properties are of great importance in fuel industries. From the study of the kinetics, they will come to know the mechanism of reaction, an half life of a reaction which are of great importance. Also they come to know how a reaction cost can be reduced by completing a reaction in shorter time at low temperature using a catalyst.
3	GE 1	The topics contained in this course are mostly a reflection of the fundamental topics of inorganic and organic chemistry included in the senior secondary level syllabus. So, recalling of the basic ideas are very much important for this course. There is ample scope to illustrate the elevated concepts based on the perceptions that are already present in the pupil's mind. After the successful completion of the course, the learners will be able to: • Illustrate the fundamental nature of subatomic particles, periodic nature of different elements along with their acid-base and oxidation-reduction behaviour. • Compare the organic reaction mechanisms on the basis of their rate, stereochemistry and applicability • Explain theoretical basis and practical pertinence of several experiments like estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture, estimation of Fe(II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator, estimation of Cu(II) ions iodometrically using $Na_2S_2O_3$, detection of functional groups etc.	
	SEM 2 COURSES		
4	CC 3	**Inorganic Chemistry-I:** Extra nuclear Structure of atom, Chemical periodicity, Acid-Base reactions, Redox Reactions and precipitation reactions	In our university, students first meet Inorganic chemistry in **SEM-II, C3.** Henceforth, the course outcomes are outlined below: 1. Gather in-depth knowledge about the concept of atomic structure regarding atoms' inner and outer cell structure. 2. Students know details about Inorganic quantum mechanics via the Schrodinger equation. 3. Understand the elements' periodicity and some significant periodic properties variations.

			4. Understand the periodic position and chemistry of Lanthanides elements. 5. Understand the concepts of a redox reaction and redox indicator function. 6. Explain various phenomena of redox reactions using Nernst Equation. 7. Understand in detail different acid-base theories, including the HSAB concept.
5	CC 4	**Organic Chemistry-II:** Stereochemistry II, General Treatment of Reaction Mechanism II, Substitution and Elimination Reactions	After successfully learning of this course the students will be able to understand clearly the stereochemical phenomena of carbon compounds which they would be able to apply to understand and to explain stereochemical features of various chemical reactions of organic chemistry courses of the forthcoming semesters. General Treatment of reaction mechanism II is very essential fundamental concepts without knowing which understanding the organic chemistry is almost impossible. After learning this topic, they will be able to explain and predict the thermodynamics and kinetics of organic reactions as well as to writing probable reaction mechanisms of any chemical reactions which may be known or unknown to them. By gaining knowledge about Substitution and Elimination Reactions, the students must be able to use these concepts in manipulating multistep synthesis of drugs, pesticides, fungicides and other essential organic molecules necessary for our daily life.
6	GE 2	From other discipline	
	SEM 3 COURSES		
7	CC 5	**Physical Chemistry-II:** Transport processes, Applications of Thermodynamics – I, Foundation of Quantum Mechanics.	By completing this course, they come to know how electroplating and electro-purification of metals are done. They also come to know how conductometric titrations can be done. All these knowledges are very significant in industry. From chemical equilibrium study, they come to know about the feasibility of a chemical reaction with the application of isotherm and how to increase the product of a reaction by the application of Le-Chatilier's principle. These also have great importance in industry. Quantum mechanics is a newly developed mechanics applicable to system having velocities of the order of light. Its application to particle in a box, simple harmonic oscillator give smore accurate results than classical mechanics and so its application is more important.
8	CC 6	**Inorganic Chemistry-II:** Chemical Bonding-I, Chemical Bonding-II, Radioactivity.	**Inorganic Chemistry course outcomes:** 1. A complete knowledge of inorganic compounds' stereochemistry using the hybridization concept. 2. Understand the chemical bond formation concept via Hybridization, VBT, and MOT. Special emphasis on ionic and covalent bonding. 3. Knowledge of solid-state defect concept. 4. Metallic bonding concept using band theory, including P/N-type semiconductor. 5. A thorough knowledge of nuclear chemistry, including fission, fusion, and spallation reaction. 6. NBE and packing fraction and radiotracer study knowledge.

9	CC 7	**Organic Chemistry-III:** Chemistry of alkenes and alkynes, Aromatic Substitution, Carbonyl and Related Compounds, Organometallics.	The students learn Theory: • Addition Chemistry of alkenes and alkynes (with name reactions) • Aromatic Electrophilic and Nucleophilic Substitution • Chemistry of Carbonyl and Related Compounds in details with name reactions (Addition, Exploitation of acidity of α-H of C=O, Elementary ideas of Green Chemistry, Nucleophilic addition to α,β-unsaturated carbonyl system, Substitution at sp2 carbon) • Detail chemistry of Organometallics (Grignard reagent, Organolithiums, Gilman cuprates) Practical: Qualitative Analysis of Single Solid Organic Compounds (Solubility, Melting point determination, Extra element and functional group detection, derivative preparation and identification of the unknown sample)
10	SEC 1	**Pharmaceutical Chemistry**	It is the intent of teaching the course ***"Pharmaceutical Chemistry"*** that the students interested in entering the field of pharmaceutical chemistry would learn the fundamental physical organic chemical principles used for drug discovery, design, drug development and drug action. This basic understanding of drug discovery, drug design and drug development can be the foundation for the future elucidation of drug action or the rational discovery of new drugs. Moreover, the students will learn the Industrial method of large scale fermentive production of several important drug molecules. This course is of particular interest to students who might be considering a future career in the pharmaceutical industry and also in Pharmaceutical Research Institutes as because through this course they will learn the basic retrosynthetic analysis and synthesis of various drug molecules as well as Industrial method of large scale fermentive production of several important drug molecules.
11	GE 3	The students learn Theory: • Chemical Energetics, Ionic and Chemical Equilibrium • Preparations and reactions of Aromatic Hydrocarbons (benzene), Organometallic Compounds (Grignard reagents: concept of umpolung, Reformatsky reaction), Aryl Halides (chloro-, bromo- and iodobenzene), Alcohols, Phenols and Ethers • Details chemistry of Carbonyl Compounds (aliphatic and aromatic) Practical: • Determination of heat capacity, enthalpy of (neutralization, ionization and hydration) • Measurement of pH • Study of the solubility of benzoic acid in water • Identification of a pure solid and liquid organic compound	
SEM 4 COURSES			
12	CC 8	**Physical Chemistry-III:** Application of Thermodynamics – II, Electrical Properties of	Colligative properties of solution give proper explanation of some important natural phenomena. Of these properties, reverse osmosis (RO) is used to purify water for drinking especially in Gulf countries.

		molecules, Quantum Chemistry.	Chemical cells are used extensively in torch, mobile phones, remotes, toys etc. So this knowledge in more important industrially. The glass electrode is extensively used in pH meter which is used in laboratory, agro and other laboratories. The concept of eutective point and its composition is helpful to prepare alloys at this composition for many advantages. This concept is also very helpful for getting fretting mixture. The concept of azeotropic temperature and composition is helpful to separate particular pair of liquids from mixture. These processes are used in large scale in industry.
13	CC 9	**Inorganic Chemistry–III:** General Principles of Metallurgy, Chemistry of *s* and *p* Block Elements, Noble Gases, Inorganic Polymers, Coordination Chemistry-I.	This semester, students will be able to have the following course outcomes: 1 Understanding the basic principles of different metallurgical processes and some vital metal isolation. 2. Complete knowledge of s- and p- block elements chemistry. 3. Detailed chemistry of the Noble gases, especially Xenon fluorides. 4. Elementary idea of Inorganic polymers such as phosphazene, borazine, polythiazyl, $(SN)_X$ etc. 5. Understanding the coordination Chemistry. 6. Complete knowledge of coordination isomerism. 7. Coordination compounds IUPAC nomenclature. 8. Coordination complexes classification like chelate and inner metallic. 9. Classified complexes' essential analytical applications.
14	CC 10	**Organic Chemistry–IV:** Nitrogen compounds, Rearrangements, The Logic of Organic Synthesis, Organic Spectroscopy.	This course is an amalgamation of already learnt concepts of organic chemistry with the deeper knowledge of organic synthesis making use of fundamental theories of different modern spectroscopic tools. Topics like the logic of organic synthesis or the spectroscopy have enormous applicability in the fields starting from medicine and polymer to cosmetics, paints and textile industries. Rationalizing, explaining and corroborating several organic synthetic problems, determining the most plausible approach of solving them may have an effect in solving real life complications. Also, through this course, learners will be able to estimate the exact amount of several important organic components viz., vitamin-C, glycine, aniline, phenol etc. Finally, students will be able to construct purposeful and efficient models of typical organic synthetic complications by employing state of the art spectroscopic devices to develop and solve trivial as well as up-to-date problems recognized by academia, researchers and industries.

15	SEC 2	**Pesticides Chemistry**	The students learn Theory: • Introduction and definition of Pesticides • Benefits and adverse effects, changing concepts of pesticides, structure activity relationship • Synthesis, manufacture and uses of representative pesticides of the following classes: Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor) Practical: • Calculation of acidity/alkalinity in given sample of pesticide as per BIS specifications • Preparation of organophosphates, phosphonates and thiophosphates
16	GE 4	Chapters like conductance and electromotive force of this course are partially based on already known concepts of basic physical chemistry. Solutions, phase equilibria, chemical analysis and chromatography are the new areas of knowledge that are not only important but also bear a wide scope of applications in the fields of research and production industries. Knowledge in the grounds of environmental chemistry is an inevitable part of learning chemistry in detail as far as present condition of our planet is concerned. To be true, survival of living systems on earth greatly depends upon the teachings we adopt from this area so long we consider the depleting nature of this planet's environment. Performing the experiments of the distribution law, phase equilibria and making use of the instruments like conductometer and potentiometer will have wide scope of solving important academic and industrial issues.	
SEM 5 COURSES			
17	CC 11	**Inorganic Chemistry-IV:** Coordination Chemistry-II, Chemistry of d- and f- block elements.	This semester, students will be able to have the following course outcomes: 1.A complete understanding of coordination chemistry in the light of VBT, CFT, LFT/MOT. 2. Understanding the concept of spinel chemistry, OSSE and EAN rule. 3. Understanding coordination compounds' colour and spectra (Orgel Diagram). 4. Understanding the details of the study of magnetic properties. 5. Detailed study of d- and f- transition elements, including magnetic and spectral studies. 6. Understanding the comparative chemistry of d and f-block chemistry. 7. Detailed study of Lanthanides and Actinides.
18	CC 12	**Organic Chemistry-V:** Carbocycles and Heterocycles, Cyclic Stereochemistry, Pericyclic reactions, Carbohydrates, Biomolecules.	By going through this Organic chemistry course, the students will gain an understanding of the fundamentals of the chemistry constituting carbohydrates, proteins and nucleic acids that will enable them to carry forward. Students will also be able to understand the basic concepts of pericyclic reactions, reactivity, transformations and synthesis of heterocyclic compounds. Listing these concepts, they will be able to synthesize various important organic molecules.
19	DSE 1	**Advanced Physical Chemistry**	Braggs diffraction study is very important in determination of crystal structure. This important in modern research especially in synthetic chemistry. Moreover, p-type, n-type semiconductors

			are made by doping of impurities which are extensively used in electronic industry. Synthetic polymers are for preparation of bottles, pipes, cable protections, fuel tanks, furniture's, laboratory apparatus, medical devices, textiles, chemical goods etc. Moreover, synthetic polymers are used in electronic devices. Now a days few biodegradable polymers are developed in order to avoid pollution arise due to the use of synthetic polymers.
20	DSE 2	**Analytical Methods in Chemistry**	1.Students gain knowledge of basic gravimetric analysis. 2. Understanding thorough knowledge of complexometric titration. 3. Gain deep knowledge of some quantitative analysis based on $KMNO_4$, $K_2Cr_2O_7$ and iodometric titration. 4. Complete knowledge of environmental chemistry related to the atmosphere. 5. A thorough knowledge of atmospheric pollution expedited by the CO, SO_X, NO_X chemicals.
	SEM 6 COURSES		
21	CC 13	**Inorganic Chemistry-V:** Bioinorganic Chemistry, Organometallic Chemistry, Catalysis by Organometallic Compounds, Reaction Kinetics and Mechanism.	This semester, students will be able to have the following course outcomes: 1. To achieve a preliminary and detailed concept of Bio-inorganic chemistry. 2. To gain knowledge of important bio-proteins like HB, MB, HMR, Cytochromes, and Ferredoxins. 3. Understanding the chemistry of chelation therapy and metal drugs function like cis-platin. 4. Understanding the concept of Organometallic chemistry and their important complexes like Zeise's salt, ferrocene, etc. 5. Catalysis function study by organometallic compounds such as hydrogenation, hydroformylation and Z-N catalysis type reaction. 6. Understanding inorganic reaction mechanisms and kinetics like cis and trans effects. 7. A detailed synthetic application of the trans effect in coordination chemistry.
22	CC 14	**Physical Chemistry-V:** Molecular Spectroscopy, Photochemistry, Surface phenomenon.	Phosphorescence and fluorescence properties are used for many practical purposes. Fluorescence materials dissolved in solution or is solid plastic bases is used to detect radioactive decay, three-dimensional structure can be studied. Moreover, various spectroscopic instruments are used for analysis purpose both in laboratory and industry. Raman spectroscopy is successfully used for rapid, easy and accurate analysis of mixtures. Rotational and vibrational spectroscopy are for measuring bond length and bond strength, respectively. The adsorption process are applied in gas masks, in removing colouring matters, in chromatography, in quantitative analysis, in dying cloths etc. So. study of adsorption is mush helpful in both industry and in analysis. The applications of colloid chemistry are limitless. Some important applications are medicines (medicines in colloidal state are more effective), sewage disposal, in purification of water, precipitation of suspended particle matter (SMP) from snake, in cleaning action of soap, in tanning leather, in rubber industry for coagulation of rubber from latex, and in dying

			fabrics. So, the concept of this course is very important for industries.
23	DSE 3	**Green Chemistry**	For the production of crop-enhancing chemical fertilizers, pesticides, fungicides, modern medicines, health-care products etc. chemists use **"Grey Chemistry"** where misuse or improper use of chemicals has led to the release of pollutants and toxic substances into land, air, and water and the production of nonbiodegradable materials, resulting in a harmful impact on the environment and living being. The mission of **"Green Chemistry"** is to eradicate the **"Grey Chemistry"** by designing chemical products and processes that reduce or eliminate the use and production of toxic or hazardous substances, and to play leading role in bringing about a sustainable Society. Therefore, by this course, the students will be capable of learning how these green chemistry approaches must efficiently and effectively utilize our renewable natural resources in a cyclical manner, reduce our energy demands, and eliminate the use and production of toxic materials to promote a strategy towards sustainable development with an aim to create a 'Greener World'. This definitely will facilitate the employability of the students in chemical industries, pharmaceutical Industries and also in chemical & pharmaceutical research institutes.
24	DSC 4	**Polymer Chemistry**	After successful completion of this course, students will develop specific skills, competencies and though processes sufficient to support further study on work in this field of polymer chemistry. Students will be able to evaluate the effects of factors such as polymer structures, molecular weight, branching and diluents on crystallinity. Students will also develop their skills to prepare various polymeric materials in small scale.

The Programme Outcome of B.Sc. (General) in Chemistry:

Upon successful completion of the general chemistry course, a student should be able to achieve the following significant program outcomes, **which are mentioned point by point as follows:**

1. Demonstration, solution, and understanding of vital major concepts in Organic/Inorganic/Physical/Analytical/Environmental chemistry disciplines.
2. Solve the problem, think methodically independently, and draw a logical conclusion about the subject chemistry.
3. Use critical thinking and scientific knowledge to design, perform, record, and analyze the results of chemical reactions.
4. Create awareness of the impact of chemistry on the environment, society, and development outside of the scientific community.
5. To inculcate scientific temperament in students and outside the scientific community.
6. Use modern scientific techniques and gain various equipment's adequate knowledge in future research work and chemical software.

Aside from usual program outcomes, students of the general chemistry branch must gain specific program outcomes mentioned below:

1. Students gain knowledge of chemistry through theory and practical experiments.
2. Students explain nomenclature, stereochemistry, structures, reactivity, and mechanism of chemical reactions.
3. Identify chemical formulas and solve numerical problems.
4. Students understand the basic principles of organic, inorganic, physical, and analytical chemistry, and their applications through various laboratory experiments.

5. Students use the necessary modern chemical tools, models, and equipment.
6. Thoroughly understand good laboratory practices and knowledge of safety.
7. Readily develop research-oriented skills.
8. The students know and handle sophisticated instruments/equipment.
9. Students are motivated to enter multidisciplinary branch research work.

The Course Outcome of B.Sc. (General) in Chemistry:

Sl. No.	SEM 1 COURSES	
1	DSC1A	The students learn Theory: • Atomic Structure, Chemical Bonding and Molecular Structure (Ionic and covalent Bonding) • Fundamentals of Organic Chemistry (Physical Effects, Cleavage of Bonds and Aromaticity) • Fundamental Stereochemistry • Preparations & reactions of Aliphatic Hydrocarbons Practical: • Volumetric Analysis ➢ Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. ➢ Estimation of oxalic acid by permanganometry. ➢ Estimation of water of crystallization in Mohr's salt ➢ Estimation of Fe (II) ions by dichromometry ➢ Estimation of Cu (II) ions iodometrically • Organic Chemistry ➢ Detection of extra elements of solid organic compounds Separation of mixtures (amino acids, sugars) by Chromatography
2	DSC2A	From other Discipline
3	DSC3A	From other Discipline
	SEM 2 COURSES	
4	DSC1B	
5	DSC2B	From other Discipline
6	DSC3B	From other Discipline
	SEM 3 COURSES	
7	DSC1C	Conductance and electrochemistry chapters of this course are moderately based on the already acknowledged ideas of elementary physical chemistry. Solutions, phase equilibria and carbohydrate are the new areas of acquaintance that are not only significant but also allow a wide choice of applications both in the fields of research and production industries. Knowledge in the grounds of carboxylic acids and its derivatives, amines and diazonium salts, amino acids, proteins etc. are unavoidable pieces of learning organic chemistry in a deeper way. Especially, appropriate knowledge in the fields of carbohydrate and protein have the potential to solve most of the human physiological as well as medicinal issues. Execution the experiments of the distribution law, phase equilibria and applications of sophisticated instruments like conductometer and potentiometer will have wide scope of solving important academic and industrial issues. Apart from these, systematic qualitative analysis of organic compounds possessing monofunctional groups and preparation of

		derivatives are one of the most important parts of training in organic chemistry at this level which have numerous opportunities of applications.
8	DSC2C	From other Discipline
9	DSC3C	From other Discipline
10	SEC 1	
	SEM 4 COURSES	
11	DSC1D	
12	DSC2D	From other Discipline
13	DSC3D	From other Discipline
14	SEC 2	The course "***Analytical Clinical Biochemistry***" has been designed to enable the UG students in enriching theoretical knowledge about the significant biomolecules such as the carbohydrates, proteins, enzymes, nucleic acids, and lipids thorough understanding their structures and functions in the organization of life. Besides, by this course the students are imparted basic training to gain concepts of assessing the human physiology through a diagnostic approach by both qualitative and quantitative blood and urine analysis. Consequently, they will acquire knowledge in the quantitative and qualitative estimation of biomolecules in the field of clinical pathology. This course will definitely enable the students to carry out routine clinical laboratory investigation (on urine and blood samples). This significantly will facilitate the employability of the students in Pharmaceutical Industries, Pathological Analytical Laboratories and also in Pharmaceutical Research Institutes.
	SEM 5 COURSES	
15	DSE 1A	There is feeble scope of recapitulation of preceding year's concepts as most of the chapters contained in this course are either new or appears to be innovative. Chapters like chemistry of 3d metals, organometallic compounds and bio-inorganic chemistry describes the very fundamental properties, structural aspects and several physiological standing of a large number of elements. Through this chapter, learners will be able to realize the biochemical importance and usefulness of different metal ions. Polynuclear and heteronuclear aromatic compounds and active methylene compounds have been discussed in elaborate manner in such a way that these two new topics can be readily understandable to the learners. In a separate chapter the topic of application of spectroscopy to simple organic molecules have been included that enable the students to acquire basic concepts of use and applications of IR and UV spectroscopic instruments.
		After successful completion of this course, students will develop specific skills, competencies and though processes sufficient to support further study on work in this field of polymer chemistry. Students will be able to evaluate the effects of factors such as polymer structures, molecular weight, branching and diluents on crystallinity. Students will also develop their skills to prepare various polymeric materials in small scale.
16	DSE 2A	From other Discipline
17	DSE3A	From other Discipline
18	SEC 3	It is the intent of teaching the course ***"Pharmaceutical Chemistry"*** that the students interested in entering the field of pharmaceutical chemistry would learn the fundamental physical organic chemical principles used for drug discovery, design, drug development and drug action. This basic understanding of drug discovery, drug design and drug development can be the foundation for the future elucidation of drug action or the rational discovery of new drugs that utilize organic chemical phenomena. Moreover, the students will learn the Industrial method of large scale fermentive production of several important drug molecules. This course is of particular interest to students who might be considering a future career in the pharmaceutical industry and also in Pharmaceutical Research Institutes as because through this course they will learn the basic retrosynthetic analysis and synthesis of various

		drug molecules as well as Industrial method of large scale fermentive production of several important drug molecules.
	SEM 6 COURSES	
19	DSE 1B	For the production of crop-enhancing chemical fertilizers, pesticides, fungicides, modern medicines, health-care products etc. chemists use "Grey Chemistry" where misuse or improper use of chemicals has led to the release of pollutants and toxic substances into land, air, and water and the production of nonbiodegradable materials, resulting in a harmful impact on the environment and living being. The mission of **"Green Chemistry"** is to eradicate the **"Grey Chemistry"** by designing chemical products and processes that reduce or eliminate the use and production of toxic or hazardous substances, and to play leading role in bringing about a sustainable Society. Therefore, by this course, the students will be capable of learning how these green chemistry approaches must efficiently and effectively utilize our renewable natural resources in a cyclical manner, reduce our energy demands, and eliminate the use and production of toxic materials to promote a strategy towards sustainable development with an aim to create a 'Greener World'. This definitely will facilitate the employability of the students in chemical industries, pharmaceutical Industries and also in chemical & pharmaceutical research institutes.
20	DSE 2B	From other Discipline
21	DSE3B	From other Discipline
22	SEC 4	The students learn Theory • Introduction and definition of Pesticides • Benefits and adverse effects, changing concepts of pesticides, structure activity relationship • Synthesis, manufacture and uses of representative pesticides of the following classes: Organochlorines (DDT, Gammexene); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor) Practical: • Calculation of acidity/alkalinity in given sample of pesticide as per BIS specifications • Preparation of organophosphates, phosphonates and thiophosphates