

CURRICULUM PLAN OF Dr. Nishant Verma
(EVEN SEMESTER 2020-21)

B.Sc. (H) Chemistry, III Year

Semester – VI

Name of Paper & Code:- CHEMISTRY-DSE: GREEN CHEMISTRY, 4 Periods per week

Contents	Allocation of Lecture	Month wise schedule to be followed	Tutorials/Assignment/ Presentation etc.
<p>Introduction to Green Chemistry What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/Obstacles in the pursuit of the goals of Green Chemistry</p>	4 Lectures	January	-Syllabus Overview -Reference Books -Problem solving
<p>Principles of Green Chemistry and Designing a Chemical synthesis Twelve principles of Green Chemistry with their explanations and special emphasis on the following with examples:</p> <ul style="list-style-type: none"> ▪ Designing a Green Synthesis using these principles; Prevention of Waste/ byproducts; maximum incorporation of the materials used in the process into the final products , Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions. ▪ Prevention/ minimization of hazardous/ toxic products reducing toxicity risk = (function) hazard x exposure ; waste or pollution prevention hierarchy ▪ Green solvents– super critical fluids, water as a solvent for organic reactions, ionic liquids, fluorous biphasic solvent, PEG, solventless processes, immobilized solvents and how to compare greenness of solvents ▪ Energy requirements for reactions – alternative sources of energy: use of microwaves and ultrasonic energy ▪ Selection of starting materials; avoidance of unnecessary derivatization – careful use of blocking/protecting groups; ▪ use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, bio catalysis, asymmetric catalysis and photo catalysis. ▪ Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD —What you don't have cannot harm you, greener alternative to Bhopal Gas Tragedy (safer route to carbaryl) and Flixiborough accident (safer route to cyclohexanol) subdivision of ISD, minimization, simplification, substitution, moderation and limitation. ▪ Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes. 	30 Lectures	January – Mid of February	- Related Problems - Assignment - Home Register Overview - Student's difficulties - Previous Year Question Papers discussion

<p>Examples of Green Synthesis/ Reactions and some real world cases</p> <ol style="list-style-type: none"> 1. Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis) 2. Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents Diels-Alder reaction and Decarboxylation reaction 3. Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine) 4. Surfactants for Carbon Dioxide – replacing smog producing and ozone depleting solvents with CO₂ for precision cleaning and dry cleaning of garments. 5. Designing of Environmentally safe marine antifoulant. 6. Rightfit pigment: synthetic azopigments to replace toxic organic and inorganic pigments. 7. An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn. 8. Healthier Fats and oil by Green Chemistry: Enzymatic Inter esterification for production of no Trans-Fats and Oils 9. Development of Fully Recyclable Carpet: Cradle to Cradle Carpeting 	16 Lectures	Mid of February-March	<ul style="list-style-type: none"> - Reactions - Revision session prior to home - Student's difficulties
<p>Future Trends in Green Chemistry</p> <p>Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal controlled solid state synthesis (C₂S₃); Green chemistry in sustainable development</p>	10 Lectures	April	<ul style="list-style-type: none"> - Related Problems - Home Register Overview