

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Name of the Course: **Green Chemistry (900118)**

Proposed By: Dr. Anjula Gaur

Department: Applied Science

Credits: 03

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Objectives: With the environmental concern and shrinking resources acquiring enormous proportions, it has become imperative to devise safer alternative materials and technology that would ensure the human sustenance. This course intends to take the students through the newer, environment friendly products and procedures and incite them to take a more holistic view of different chemical processes.

Unit I 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. Definition and concepts: green chemistry; sustainable consumption of resources; individual and community level participation such as small-scale composting pits for biodegradable waste.

Unit II Principles of Green Chemistry and Designing a Chemical synthesis.

Twelve principles of Green Chemistry with their explanations and examples; 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).

Unit III- Cleaner Production

The Cleaner Production Concept , Why Cleaner Production , Difference With End of Pipe Concept, Cleaner Production and Sustainable Development, Implementation of Cleaner Production , Change of Raw Material, Technology Change, Good Operating Practice, Product Change, On Site Reuse And Recycling, Who Is Responsible For Cleaner Production, Government Rules, Green Synthesis of Nano Particles.

Unit IV- Green Chemical Strategies for Sustainable Development

Areas of green chemistry, Reaction mass balance-Atom Economy, Evaluation for Chemical Reaction Efficiency, Green Solvents/ reaction Media, Catalysis and Bio catalysis. Microwave oven as a reactor, Theory of Microwave Heating.

Unit V Photochemical Degradation: An Eco-friendly Approach of Waste Treatment

Photochemical Principles, Heterogeneous Photo-catalysis, Homogeneous Photo-degradation, photo oxidation, Direct Photo-degradation, Gas phase Detoxification, Equipments and applications.

Course outcome – Upon successful completion of the course, the student will be able to

CO1 Explain the field of green chemistry.

CO2 Acquire knowledge of the 12 principles of green chemistry.

CO3 Develop an understanding of cleaner production and green synthesis methods

CO4 Acquire the Knowledge of catalysis, and microwave theory.

CO5 Appreciate the Principle of Photochemical.

Reference Books: -

1. Anastas, P. T., Warner, J. Green Chemistry: Theory and Practice; Oxford University Press: London, 1998.
2. Mukesh Doble, Anil Kumar Kruthiventi, in Green Chemistry and Engineering, 2007
3. V.K. Ahluwalia & M.R. Kidwai: New Trends in Green Chemistry, Anamalaya Publishers (2005).
4. P.T. Anastas & J.K. Warner: Oxford Green Chemistry- Theory and Practical, University Press (1998).
5. A.S. Matlack: Introduction to Green Chemistry, Marcel Deckkar (2001).
6. M.C. Cann & M.E. Connely: Real-World cases in Green Chemistry, American Chemical Society, Washington (2000).
7. M.A. Ryan & M. Tinneland, Introduction to Green Chemistry, American Chemical Society, Washington (2002).