Yogoda Satsanga Mahavidyalaya

Department of Chemistry

Course Plan for Green Chemistry (DSE 3)

(i) Course Information

- **Course Title:** Green Chemistry.
- Course Code: DSE-3
- Teacher: Dr. N. N. Chaudhary
- Contact Details: nnchaudhary60@gmail.com
- Class Schedule: Monday to Saturday 10:30AM to 3:30PM
- Location: Chemistry Department, Y. S. M
- Office hours: 10:30AM to 4:30PM

Credits: 6 (Theory - 4, Practical - 2)

Total Marks: 75 (MSE: 15 Marks, ESE: 60 Marks)

Pass Marks: 30 (Theory: MSE + ESE)

Duration: 60 Lectures (Theory), 30 Hours (Practical Classes)

(ii) Course Description

Green Chemistry focuses on designing products and processes that minimize the use and generation of hazardous substances. This course introduces students to the principles and practices of Green Chemistry, aiming to provide a comprehensive understanding of environmentally friendly chemical processes. The curriculum includes theoretical concepts, practical applications, and future trends in Green Chemistry, emphasizing sustainable development.

(iii) Learning Objectives

By the end of this course, students will be able to:

1. Understand the need and goals of Green Chemistry.
2. Apply the twelve principles of Green Chemistry to design safer chemical processes.
3. Identify and implement green synthesis methods for various compounds.
4. Utilize microwave and ultrasound-assisted reactions in Green Chemistry.
5. Explore future trends and innovative approaches in Green Chemistry.
6. Develop practical skills in conducting green chemical experiments.

(iv) Course Outline & Schedule

Unit-1: Introduction to Green Chemistry (Lectures: 4)

1. What is Green Chemistry?
2. Need for Green Chemistry
3. Goals of Green Chemistry
4. Limitations/Obstacles in the pursuit of Green Chemistry goals

Unit-2: Principles of Green Chemistry and Designing a Chemical Synthesis (Lectures: 15)

1. Twelve Principles of Green Chemistry with examples
2. Designing a Green Synthesis
3. Prevention of Waste/Byproducts
4. Atom Economy
5. Minimization of hazardous/toxic products
6. Designing safer chemicals
7. Selection of appropriate auxiliary substances
8. Green solvents and solventless processes
9. Energy requirements: Use of microwaves and ultrasonic energy

10. Selection of starting materials
11. Avoidance of unnecessary derivatization
12. Use of catalytic reagents
13. Designing biodegradable products
14. Prevention of chemical accidents
15. Development of analytical techniques

Unit-3: Examples of Green Synthesis/Reactions (Lectures: 24)

1. Green synthesis of various compounds (Lectures:5)
2. Microwave-assisted reactions in water and organic solvents (Lectures:5)
3. Ultrasound-assisted reactions (Lectures:5)
4. Selective methylation and polymerization (Lectures:5)
5. Use of nonmetallic oxidative reagents and biocatalysis (Lectures:5)

Unit-4: Future Trends in Green Chemistry (Lectures: 8)

1. Oxidation reagents and catalysts
2. Biomimetic and multifunctional reagents
3. Combinatorial green chemistry
4. Solventless reactions
5. Noncovalent derivatization
6. Green chemistry in sustainable development

(v) Instructional Methods

- **Lectures:** Interactive sessions with multimedia presentations.
- **Practical Labs:** Hands-on experiments to reinforce theoretical knowledge.
- **Group Discussions:** Collaborative discussions on green chemistry principles and applications.
- **Case Studies:** Real-world examples to illustrate the impact and importance of Green Chemistry.

- **Guest Lectures:** Invited experts from the industry to share insights and experiences.

(vi) Assessment & Grading:

Unit	1	2	3	4
Lectures	**4**	**15**	**24**	**8**
Quizzes	**1**	**1**	**2**	**1**
Assignment	**-**	**1**	**2**	**1**
Class Tests	**-**	**1**	**1**	
Mid-Sem	**-**	**1**	**-**	**-**
End-Sem				**1**

(vii) Resources & Procedure

Textbooks:

1. V.K. Ahluwalia & M.R. Kidwai: New Trends in Green Chemistry, Anamalaya Publishers (2005).
2. P.T. Anastas & J.K. Warner: Oxford Green Chemistry- Theory and Practical, University Press (1998).
3. A.S. Matlack: Introduction to Green Chemistry, Marcel Dekker (2001).
4. M.C. Cann & M.E. Connely: Real-World cases in Green Chemistry, American Chemical Society, Washington (2000).
5. M.A. Ryan & M. Tinnesand, Introduction to Green Chemistry, American Chemical Society, Washington (2002).

(viii) Procedure:

- Weekly reading assignments from the textbooks.
- Practical manuals and lab notebooks for laboratory sessions.

- Access to online resources and research papers for advanced reading.

(ix) Supports of Institution

- **Library Access:** Availability of textbooks, reference books, and journals on Green Chemistry.
- **Laboratory Facilities:** Well-equipped labs with necessary apparatus for green chemistry experiments.
- **Online Learning Platform:** Access to lecture notes, assignments, and supplementary materials.
- **Counseling and Mentoring:** Academic support and guidance from faculty members.
- **Workshops and Seminars:** Regularly organized events to enhance learning and exposure to current trends in Green Chemistry.