School of Chemistry
Faculty of Science
University of the Punjab, Lahore
Course Outline

BS Chemistry Semester-III					
Programme	**BS Chemistry**	**Course Code**	**Chem-291**	**Credit Hours**	**2**
Course Title	**Introduction to Green Chemistry**		**Course Type**	**Major Elective**	

Course Introduction

This course presents the fundamentals of green chemistry and the science behind sustainability issues with efforts that can be taken to create solutions. Green Chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances. While there are many mechanisms and tools available to assess the impact of materials and processes on human health and the environment, there are few tools available to help design and create products as such. The course contents are provided below.

Introduction to Green Chemistry, principles of Green Chemistry; waste reduction, atom economy, non-hazardous syntheses, safe chemicals and solvents, minimal energy consumption, renewable energy consumption, renewable raw materials, simple chemistry, catalysis, degradability, real-time analysis, and accident prevention.

Learning Outcomes

On the completion of the course, the students will be able to:

1. Demonstrate a broader and deeper understanding of the twelve principles of green chemistry
2. Evaluate technologies and products by applying the methods and tools of green chemistry in the practice of chemistry.
3. Evaluate, whether a chemical transformation can be classified as environment friendly and sustainable, or which parameters need to be optimized in order to achieve this.
4. Explain how the application of green chemistry principles can address sustainability issues.

Course Content		Assignments/Readings
Week 1	What is green chemistry? The origin and background of green chemistry	Related reading
Week 2	Why green chemistry is called sustainable chemistry? Concept of 4R's.	Related reading
Week 3	Significance, goals and limitations of green chemistry	Related reading
Week 4	An overview of principles of green chemistry	Related reading
Week 5	Waste reduction and atom economy	Related reading
Week 6	Non-hazardous synthesis	Related reading
Week 7	Green solvents and safe chemicals	Related reading
Week 8	**Mid-term Examination**	
Week 9	Energy efficient processes	Related reading
Week 10	Renewable energy consumption	Related reading
Week 11	Use of renewable raw materials	Related reading
Week 12	Catalysis and use of catalytic reagents	Related reading

Week 13	Reduce derivatives or minimization of steps (simple chemistry) and design for degradability	Related reading
Week 14	Accident Prevention and real time analysis	Related reading
Week 15	Current trends, developments and innovations in green chemistry	Related reading
Week 16	**Final term Examination**	

Textbooks and Reading Material

1. Sankar P. Day, Nayim Sep, (2021), *A Textbook of Green Chemistry, Edition 1st,* Techno World Publisher.
2. M. Lancaster, (2016), *Green Chemistry: An Introductory Text, Edition 3,* RSC Publishers.
3. P. Anastas and P. Trevorrow, (2013), *Handbook of Green Chemistry, Green Processes, Designing Safer Chemicals,* Wiley Publishers.
4. A. Lapkin and D. Constable, (2008), *Green Chemistry Metrics: Measuring and Monitoring Sustainable Processes,* Wiley Publishers.
5. J. H. Clark, A. Hunt, C. Topi, G. Paggiola and J. Sherwood, (2017), *Sustainable Solvents: Perspectives from Research, Business and International Policy (Green Chemistry Series),* RSC Publishers.

Teaching Learning Strategies

Class lecture method, which includes seminars, discussions, assignments and projects. Audio-visual tools will be used where necessary

Assignments: Types and Number with Calendar

1. Written Task
2. Presentation
3. Tutorials
4. Solving related exercises

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.