

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



BS Chemistry Semester-V					
Programme	BS Chemistry	Course Code	Chem-391	Credit Hours	2
Course Title	Introduction to Green Solvents		Course Type	Major Elective	
Course Introduction					
<p>This course is aimed to make students learn about green solvents essential for any of the chemical reaction to make it environmentally benign. It explores the principles, applications and environmental impacts of green solvents in chemical processes.</p> <p>Introduction to green solvents, traditional solvents and their impact, traditional vs green solvents, solvent selection and evaluation, types of green solvents, water, supercritical fluids, ionic liquids & deep eutectic mixtures, physiochemical properties of green solvents, nomenclature of ionic liquids, synthesis of ionic liquids, applications of green solvents in organic synthesis and industrial processes. Challenges and future directions</p>					
Learning Outcomes					
<p>On the completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the principles of green chemistry and solvent selection 2. Explore various types of green solvents and their applications 3. Evaluate the environment and economic impact of traditional vs green solvents 4. Explore the applications of green solvents in various lab scale processes 					
Course Content				Assignments/Readings	
Week 1	Introduction to green solvents			Related reading	
Week 2	Traditional solvents and their impact			Related reading	
Week 3	Traditional vs. green solvents			Related reading	
Week 4	Solvent selection and evaluation			Related reading	
Week 5	Types of green solvents			Related reading	
Week 6	Water and supercritical fluids as green solvents			Related reading	
Week 7	Ionic liquids and deep eutectic mixtures as green solvents			Related reading	
Week 8	Mid-term Examination				
Week 9	Physiochemical properties of green solvents			Related reading	
Week 10	Types and nomenclature of ionic liquids			Related reading	
Week 11	Synthesis of ionic liquids			Related reading	
Week 12	Task specific ionic liquids and their significance			Related reading	
Week 13	Applications of green solvents in organic synthesis			Related reading	

Week 14	Applications of green solvents in industrial processes	Related reading	
Week 15	Challenges and future directions	Related reading	
Week 16	Final term Examination		
Textbooks and Reading Material			
<p>1. J. H. Clark, A. Hunt, C. Topi, G. Paggiola and J. Sherwood, (2017), <i>Sustainable Solvents: Perspectives from Research, Business and International Policy (Green Chemistry Series)</i>, RSC Publishers.</p> <p>2. A. Lapkin and D. Constable, (2008), <i>Green Chemistry Metrics: Measuring and Monitoring Sustainable Processes</i>, Wiley Publishers.</p> <p>3. Douglas, R. Macfarlane, Mega Kar, and Jennifer M. Pringle, (2017), <i>Fundamentals of Ionic Liquids, from Chemistry to Applications</i>, Wiley VCH publishers.</p> <p>4. Micheal Frementle, (2010), <i>An Introduction to Ionic Liquids</i>, RSC Publishers.</p> <p>5. Jason P. Hallett. (2010), <i>An Introduction to Ionic Liquids</i>, RSC Publishers.</p> <p>6. Suojiang Zhang, Xinmei Lu, Sucai Li. (2009), <i>Ionic Liquids: Physicochemical Properties</i>, Elsevier Publishers</p> <p>7. P. Anastas and P. Trevorow, (2013), <i>Handbook of Green Chemistry, Green Processes, Designing Safer Chemicals</i>, Wiley Publishers</p>			
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			
<ol style="list-style-type: none"> 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.

BS Chemistry Semester-V					
Programme	BS Chemistry	Course Code	Chem-392	Credit Hours	1
Course Title	Green Solvents Lab		Course Type	Major Elective	
Course Introduction					
<p>This course is aimed to make students learn the practical applications of green solvents essential for any of the chemical reaction to make it environmentally benign. It explores the principles, applications and environmental impacts of green solvents in chemical processes. Synthesis of green solvents, Solvent evaluation traditional vs green solvents, applications of green solvents in chemical processes, organic reactions using green solvents</p>					
Learning Outcomes					
<p>On the completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the principles of green chemistry and solvent selection 2. Explore various types of green solvents and their applications 3. Evaluate the environment and economic impact of traditional vs green solvents 4. Explore the applications of green solvents in various lab scale processes 					
Course Content			Assignments/Readings		
Week 1	Tools and techniques for green solvent selection		Related reading		
Week 2	Using water as solvent for organic reaction (oxidation/reduction/Diels-Alder reaction /any suitable reaction)		Related reading		
Week 3	Using water as solvent for organic reaction (oxidation/reduction/Diels-Alder reaction /any suitable reaction)		Related reading		
Week 4	Using water as solvent for organic reaction (oxidation/reduction/Diels-Alder reaction /any suitable reaction)		Related reading		
Week 5	Synthesis of acidic ionic liquid		Related reading		
Week 6	Synthesis of basic ionic liquid		Related reading		
Week 7	Synthesis of room temperature ionic liquid		Related reading		
Week 8	Mid-term Examination				
Week 9	Synthesis of deep eutectic solvents		Related reading		
Week 10	Synthesis of deep eutectic solvents		Related reading		
Week 11	Organic synthesis using ionic liquids (Wittig reaction/Friedel Crafts/Diels-Alder/reduction reaction)		Related reading		
Week 12	Organic synthesis using ionic liquids (Wittig reaction/Friedel Crafts/Diels-Alder/reduction reaction)		Related reading		
Week 13	Organic synthesis using ionic liquids (Wittig reaction/Friedel Crafts/Diels-Alder/reduction reaction)		Related reading		

Week 14	Organic synthesis using ionic liquids (Wittig reaction/Friedel Crafts/Diels-Alder/reduction reaction)	Related reading	
Week 15	Dissolution of cellulose using ionic liquids	Related reading	
Week 16	Final term Examination		
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