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

BS Chemistry Semester-III					
Programme	**BS Chemistry**	**Course Code**	**Chem-261**	**Credit Hours**	**2**
Course Title	**Water Treatment and Cleansers**		**Course Type**	**Major Elective**	

Course Introduction

This course content will help the students to understand the chemistry of water regarding its industrial use in particular. It will also help them to learn about the operations and processes involved in manufacturing of soaps and detergents.

Water for Industry:

Importance of Water in industry; Criteria of water quality for industrial use; Water hardness; softening of water by classical methods, Ion-exchange, Demineralization, Reverse osmosis and Distillation; Boiler Scaling, types, effects and mechanism; Removal of Boiler scales, Physical and Chemical methods.

Soaps, Detergents And Disinfectants:

Soaps – Introduction, types, raw materials, counter-current method for soap manufacturing, recovery glycerin from spent lye and sweet water, builders and Additives.

Detergents – Introduction, theory and working of detergents, cationic, anionic and non-ionic and amphoteric detergents, synthesis of typical anionic detergents, fabric softener (introduction and mechanism of action), Environmental impact of detergents.

Disinfectants – Introduction, types and applications.

Learning Outcomes

On the completion of the course:

1. The students will become familiarized with the concepts of general chemistry
2. This will enable them to qualify for basic to moderate level jobs involving general knowledge of chemistry
3. The obtained knowledge shall also enable the students to enter into various entrepreneurial activities involving general introduction to chemistry
4. Students will be able to understand the concept of GLP and GMP

Course Content		Assignments/Readings
Week 1	Importance of water in industry; criteria of water quality for industrial use.	Class Based learning/tests
Week 2	Water Hardness	Class Based learning/tests
Week 3	Water Hardness	Class Based learning/tests
Week 4	Softening of water	Class Based learning/tests

Week 5	Ion Exchanger, Demineralization	Class Based learning/tests
Week 6	Reverse Osmosis	Class Based learning/tests
Week 7	Distillation	Written Assignment
Week 8	Boiler Scale and Removal	Class Based learning/tests
Week 9	Midterm Assessment	Class Based learning/tests
Week 10	Soaps – Introduction, types, raw materials,	Class Based learning/tests
Week 11	Counter Current Method	Class Based learning/tests
Week 12	Glycerin Recovery	Class Based learning/tests
Week 13	Builder and Additives	Class Based learning/tests
Week 14	Detergents	Class Based learning/tests
Week 15	Spray Drying Process of Detergents Manufacturing	Quiz
Week 16	Disinfectants	Class Based learning/tests

Textbooks and Reading Material

1. Applied Chemistry, Haq Nawaz Bhatti and Muhammad Salman, 2017, Caravan Book Publisher, Pakistan.
2. Water Supply and Sewerage, T.J.McGhee, McGraw Hill Book Co. New York.(1991)
3. Hand Book of Industrial Chemicals, By SIRI Board of Consultants and Engineers,
4. Shereve's Chemical Process Industries, 5th Ed.1975 by G.T.Austin McGraw Hill Book Co. New York.
5. Industrial chemistry, B. K. Sharma Krishna Prakashan Media (P) Ltd., Ed-15 (2006)

Teaching Learning Strategies

1. Lectures
2. Group Discussion
3. Laboratory work
4. Seminar / Workshop

Assignments: Types and Number with Calendar
1. Written 7th week **2.** Quiz 15th week

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.