ANNEXURE-III

Programme: M. Sc. Chemistry (Skill Based Course)

Course Code:- CHCS-501

Title of the Course: Laboratory safety, first aid and waste management (A course on transferable life skills)

Number of Credits: 02 **Total Hours: 30** **Effective from AY: 2022-2023**

Prerequisites for the Course:	Should have studied B. Sc.
Course Objective:	1. Study of various concepts related to laboratory and industrial safety. 2. Study of various methods and techniques for First aid. 3. Study of various methodologies of waste management.
Course Outcome:	1. Students will be in a position to understand how to work safely while handling chemicals in laboratory and industries. 2. Students will be in a position to help with First aid in case of accidents. 3. Students will be in a position to handle waste management.

Content	Hours
1. Laboratory safety. 1.1. Responsibilities in laboratory - Purpose and responsibilities - Basic laboratory safety practices 1.2. Chemical Managements - Introduction to chemical inventory and material safety data sheet - Chemical storage and chemical labelling - Transportation of chemicals in laboratory - Special chemical hazards 1.3. Introduction to Personal protective equipments. - Eye protection, face protection, hand protection, head protection, foot protection, protective clothing, respiratory protection and hearing protection. 1.4. Safe handling of glasswares	4
2. **Fire Safety:** 2.1. Chemistry of Fire - Fire Tetrahedron - Combustion	4

- Flame -Premixed and Diffusion Flame, Practical Examples of Premixed Flames and Diffusion Flames - Ignition - Self Heating and Spontaneous Combustion, Smoldering - Stages in a Fire - Heat Transfer - Fire Hazards of Materials - Sources of Information on Hazardous Materials 2.2. Fire Extinguishment - Classifications of Fires - Extinguishing Agents -Water, Carbon Dioxide, Halogenated Agents / Clean Agents, Dry Chemicals, Foam Extinguishing Agents, Combustible Metal Extinguishing Agents, Kitchen Fires 2.3. Introduction to Fire Extinguishers -Fire Extinguisher Use in The Workplace -Maintenance, Inspection, And Testing of portable fire extinguishers	
3. Industrial Safety. 3.1. Risk, Hazard, types of hazards -Introduction to engineering controls and administrative controls 3.2. Safety in industry - Safe/Unsafe Condition, Safe/Unsafe Acts, Near Miss - Risk Assessment (Procedure and protocols with example) 3.3. Hazardous Chemical Waste - Types of Waste, Waste minimization - Waste Management, segregation and disposal 3.4. Demonstration - Mock fire drill - Mock evacuation drill - Safety audits	7
4. Hygiene and Occupational safety - Introduction to Occupational Safety and Health, occupational hygiene - Basics of Ergonomic; Ergonomic disorders and preventive measures for improved health and safety - Selecting appropriate ergonomic chair, manual material handling	5

- Musculoskeletal exercises for lab personnel - Need for Hygiene and types of Hygiene (demonstration)		
5. Basic First Aid 5.1. Introduction to First Aid - Origin, aim and scope of first aid, Overview of the human body 5.2. First aid equipment - Contents of the first aid box - Role and responsibilities of a first aider - Assessing the situation and acting safely, effectively and promptly in an emergency 5.3. Emergency care - Assessing the Victim: primary survey, secondary survey, head-to-toe examination, monitoring vital signs - use of eyewash and showers for chemical spillage - Cardiopulmonary Resuscitation (CPR) - Airway Obstructions - Controlling Bleeding - Managing unconscious casualty: checking and monitoring breathing and circulation, life-saving priorities for unconscious adults, unconscious child, unconscious infant. 5.4. Protocols for Common injuries and their immediate care for different emergencies - Shock, Wounds and soft tissue Injuries, Burns, Head and spinal Injuries, Chest, Abdominal and Pelvic Injuries, Bone, Joint and Muscle Injuries, Extremity Injuries and Splinting, Poisoning, Bites and Stings Sudden illness, Drowning, hyperventilation, asthma, Cold and heat emergencies, Electrical Incidences, choking in adults and infants.		5
6. Sewage Treatment 6.1. Introduction to the waste treatments, Types of waste: Solid, Liquid and Gaseous - Environmental laws: The water (Pollution and control of pollution) Act, 1974 6.2. General characteristics of waste: Liquid waste - Electrical conductivity, pH, COD, BOD, TS and TDS, total suspended solids, total volatile solids, chlorides, sulphates, oil & grease. 6.3. Waste Water Treatment Technologies: A. Primary treatment methods B. Secondary treatment methods and C. Tertiary treatment methods - Sludge disposal: Methods of sludge disposal. Sources and effects of sludge on environment. 6.4. Visit to Sewage treatment plant.		5
Pedagogy	Lectures & tutorials. Seminars / assignments / presentations / demonstrations / self-study or a combination of some of these could also be used.	

References /Readings:	1. C. C. Fevzi and I. Adnan, Laboratory safety handbook, 1st Edition, 2016, Sabanci University. 2. Laboratory safety manual, Environmental Health and Safety Department, University of Washington, December 2021 Edition. (www.ehs.washington.edu) 3. D. Philpott, Fundamentals of Fire Protection for the Safety Professional, 3rd Edition, 2022, Bernan Press. 4. Indian Standard- 2190:2010, Selection, Installation and Maintenance of First-Aid Fire Extinguishers — Code of Practice (Fourth Revision) (http://tricone.co.in/Downloads/selection,installation_and_maintenance_of_first-Aid_Fire_Extinguishers1_IS%201290.pdf) 5. K. R. Muller, Chemical waste handling and treatment, 1st Edition, 1986, Springer Verlag Berlin Heidelberg. 6. Prudent practices in the laboratory: handling and management of chemical hazards, the National Academic Press, 2nd Edition, 2011, National Academies Press. 7. K. Park, Park's text book of Preventive and Social Medicine, 19th Edition, 2007, Banarsidas Bhanot publishers, India 8. NIEHS Health and Safety Guide to Laboratory Ergonomics. (https://ehs.uky.edu/docs/pdf/ohs_erg_ergonomics_guide_0001.pdf) 9. M. B. Pamela, Ergonomics Foundational Principles Applications and Technologies, 1st Edition, 2021, Taylor & Francis publisher. 10. The authorized manual of St. John Ambulance, St. Andrew's Ambulance association and the British red cross society, First Aid manual, 9th Edition, 2011, Dorling Kindersley. 11. J. R. Krohmer, American college of emergency physicians First Aid manual, 5th Edition, Dorling Kindersley. 12. I. Clement, Text book on First Aid & Emergency Nursing, 1st Edition, 2012, JP brothers. 13. P. Jevon, Emergency care and First Aid for Nurses, A practical guide, 1st Edition, 2007, Churchill Living Stone. 14. M. N. Rao and A.K. Datta, Waste Water Treatment, 3rd Edition, 2017, Oxford & IBH Publishing Co. Pvt. Ltd. 15. M. J. Hammer, Sewage and waste treatment, 7th Edition, 2012, Prentice Hall India Learning Private Limited.