



# MANGALORE UNIVERSITY

## Department of Industrial Chemistry MSc INDUSTRIAL CHEMISTRY

### ICS 404: ENVIRONMENT, HEALTH AND SAFETY MEASURES

#### Course Outcomes:

1. Fundamentals, analysis and control methods of air and water pollution
2. Quality control and quality assurance aspects used in industry and the laws regarding QA and QC along with chemical warfare convention.
3. Learns about good lab practices.

#### UNIT I:

10 hrs

**Air Pollution, Analysis & Control Methods:** Qualitative study of environmental segments, air pollutants, prevention & control, Green house gases & acid rain. Carbon monoxide, industrial sources & transportation sources. SO<sub>x</sub>-sources, control techniques-scrubbing, limestone injection process. Ozone hole & CFC's. Photochemical smog & PAN. NO<sub>x</sub> - Sources, NO<sub>x</sub> control techniques. Particulates: Size distribution, particulate collection-settling chambers, centrifugal separators, wet scrubbers, electrostatic precipitators & fabric filters. Analysis of air pollutants, Dispersion of air pollutants-weather, wind speed and acidity.

#### UNIT II:

10 hrs

**Water, Waste Water Treatment and Analysis:** Hydrologic cycle, sources, criteria & standards of water quality- safe drinking water, maximum contamination levels of inorganic & organic chemicals, radiological contaminants, turbidity, microbial contaminants. Public health significance & measurement of colour, turbidity, total solids, acidity, fluoride, alkalinity, hardness, chloride, residual chlorine, sulphate, fluoride, phosphate & different forms of nitrogen in natural & polluted water.

#### UNIT III:

12hrs

**Quality Control and Quality Assurance:** Role, Government standards like ISI, MINAS, Agmark, I.P., ASTM. Concepts of quality and quality control, the nature of variabilities. Specification and tolerances, sampling inspection, cost reduction and quality improvement experiments. Optimization.

Basic concepts of quality assurance, quality acceptance, sampling, reliability, cost aspects of quality decisions. Quality control in raw materials, production (in process) and finished product. Current trends in quality control, ISO 9000 and ISO 14000 series. Laws related to quality control. ISO 17025.

**Chemical Warfare Convention:** Definitions and schedules. Toxic chemicals, remote control systems, tear gas, chemical weapons, ocean dumping of chemical weapons.

#### UNIT -IV:

10hrs

**Good Laboratory Practices:** Safety equipments, personal protective equipments, compressed gas safety, procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewer system, incineration and transportation of hazardous chemicals.

Emergency response-Chemical spills, radiation spills, biohazard spills, leaking compressed gas cylinders, fires, medical emergency accident reporting. Safety rules of laboratory acquaintance of experimental set up and instruments, intellectual property and intellectual property rights. Data management, importance of safety and security of data.

#### References

1. Environmental Chemistry, A.K. Dey, Wiley Eastern.
2. Environmental Chemistry, S.K. Banerji, Prentice Hall India, 1993.
3. Chemistry of Water Treatment, S.D. Faust and O.M. Aly, Butterworths, 1983.
4. Environmental chemistry, Ahluwalia V K, Anne Books India, 2008.
5. Chemistry for Environmental Engineering, Sawyer and McCarty, McGraw Hill, 1978.
6. Environmental Chemistry, I. Williams, John Wiley, 2001
7. Statistical Quality Control, 2<sup>nd</sup> Edn., Manohar Mahajan Dampat Rai and Sons, 1995.
8. Quality management: a process improvement approach, Fryman Mark A, Cengage learning, 2002.
9. Quality Control, Paranthaman D, Tata, McGraw Hill, 1987.
10. Gupta R. N. Chemical warfare and casualty management 2011
11. Vyas M. N. Safety and hazards management in chemical industries 2013. Atlantic publication.
12. Dikshith T.S.S Safety evaluation of environmental chemicals. New Age International, 1996.
13. Chemical Safety Matters-IUPAC-IPCS, Cambridge Univ. Press, 1992