

Programme: M. Sc. (Marine Sciences)

Course Code: MSO 272

Title of the Course: Marine Chemistry II

Number of Credits: 01

Effective from AY: June 2018-19

Prerequisites for the course:	Degree of Bachelor of Science of this University or an examination of any other University recognized as equivalent.	
Objective:	This course develops concepts about the chemistry of the marine environment that concerns the study of the properties and interactions of the substances present in the marine environment.	
Content:	Micro-nutrient elements (P, N and Si) in seawater – Forms in seawater, distribution and cycle, N:P ratios – Stoichiometry of the uptake and regeneration of the nutrient elements and of oxygen – Chemical oceanography of the seas around India – Instruments used in chemical oceanography. Atmospheric chemistry and air-sea interactions – Composition of the atmosphere, steady state or equilibrium, sources of gases in the atmosphere, reactivity of trace gases in the atmosphere, acid rain, ozone hole; chemistry of sea surface microlayer – Origin, thickness and collection of surface material, properties of the sea surface micro-layer.	12 hours
Pedagogy:	Lectures/ tutorials/ assignments/ self-study	

**References/
Readings**

1. Introduction to Marine Chemistry, 1971 – Riley, J.P. and Chester, R., Academic Press.
2. Chemical Oceanography (Vol.1, 2, 3 & 8), 1975 – Riley, J.P. & Skirrow, G., Academic Press.
3. Marine Chemistry, 1969 – Horne, R.A., Wiley-Interscience
4. Seawater: Its composition, properties & behaviour, 1989, 1995, 2004 – The Open University.
5. Marine Chemistry (Vol.2), 1970 – Martin, D.F., Marcel Dekker, NY.
6. Tracers in the Sea, 1982 – Broecker and Peng., Lamont-Doherty Geological Observatory, NY.
7. Marine Geochemistry, 1990, 2000 – Chester, R., Blackwell Science.
8. Chemical Oceanography, 1992 – Millero, F. J. and Sohn, M.L., CRC Press.
9. Dynamic processes in the chemistry of the upper ocean, 1986 - Burton et al., Plenum Press.
10. The chemistry of the Atmosphere and Oceans, 1978 – Holland, H.D., Wiley.
11. An Introduction to Environmental Chemistry, 1996 – Andrews et al., Blackwell science.
12. Environmental Chemistry, 1994 - De, A.K., Wiley – Eastern Ltd.
13. Geosphere – Biosphere Interactions and Climate, 2001 – L.O.Bengtsson and C.U.Hammer., Cambridge University Press.
14. Oceanography of the Indian Ocean, 1992 – B. N. Dessai (Ed.), AA Balkema.
15. Chemical Oceanography of the Indian Ocean, North of Equator. 1984, Sengupta and Naqvi, Deep Sea Res. 31A, 671-706.
16. Chemical Oceanography, 1996, 2006 – F. J. Millero, CRC Press.
17. The Sea Surface and Global Change, 1997, 2005 – P.S. Liss and R. Duce., Cambridge University Press.
18. Ocean Biogeochemistry: The role of the ocean carbon cycle in Global change, 2003 – M.J.R. Fasham, Springer.
19. An Introduction to Marine Biogeochemistry, 2nd edition, 2009 – S.B.Libes, Wiley.
20. Marine Chemistry and Geochemistry, 2010 – K. K. Turekian, Academic Press.
21. An Introduction to the Chemistry of the Sea, 2nd edition, 2013 – M.E.Q. Pilson, Cambridge University Press.

**Learning
Outcomes**

1. Provide a comprehensive understanding of the properties and interactions of the substances present in the marine environment.
2. Explain the key processes operating in the marine environment.
3. Explain the importance of dissolved O₂, the marine carbon cycling and the CO₂ problem.
4. Explain the biogeochemical cycling of the nutrients from the perspective of the global biogeochemical cycling of elements.