Programme: M. Sc. (Marine Sciences)
Course Code: MSC 162 **Title of the Course: Marine Chemistry I**
Number of Credits: 03
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:	Symbols and units used in chemical oceanography – Major and minor elements in seawater – Geochemical balance of the oceans, residence times, chemical speciation.	12 hours
	Constancy of relative ionic composition of seawater, conditions under which major elements may not be conservative, factors affecting the distribution of trace elements in the sea, interaction of trace elements with marine organisms, enrichment factor, Chlorinity and salinity: definition and significance, practical salinity scale, Radioactive nuclides in the sea.	12 hours
	Dissolved gases (other than CO_2) in seawater – Basic concepts : solubility of gases in seawater, air – sea gas exchange, processes affecting their distribution, dissolved oxygen in the ocean – Dissolved gases (CO_2) in seawater – Carbon dioxide equilibria in seawater; pH, alkalinity and buffering capacity of oceans: components of CO_2 system in seawater – Percentage composition of inorganic carbon; calcium carbonate precipitation and dissolution phenomena – Lyso-cline and carbonate compensation depth.	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 O_2, the marine carbon cycling and the CO_2 problem. 4. Explain the biogeochemical cycling of the trace metals from the perspective of the global biogeochemical cycling of elements.	