Programme: M. Sc. (Marine Sciences)
Course Code: MSO 280 **Title of the Course: Marine Chemistry Practical III**
Number of Credits: 01
Effective from AY: June 2018-19

Prerequisites for the course:	Students who have undergone semester I of Marine Sciences.
Objective:	This course deals with the Analytical Chemistry of Seawater.

Content:	1. Determination of sulphate in seawater gravimetrically by precipitation of $BaSO_4$ using $BaCl_2$ in the presence of picric acid (6 hrs; Ref 1) 2. Determination of thiosulphate in seawater by iodometric titration with the removal of sulphide using zinc acetate (6 hrs; Ref 1) 3. Determination of bromide in seawater by oxidizing to bromate using hypochlorite followed by iodometric titration (6 hrs; Ref 1) 4. Spectrophotometric determination of urea in seawater by diacetyl monoxime – semicarbazide method (6 hrs; Ref 1) 5. Spectrophotometric determination of carbohydrates in seawater by 3- methyl-2-benzothiazoline hydrazone (MBTH) method (6 hrs; Ref 1)	24 hours
Pedagogy:	Laboratory experiments/ field studies	
References/ Readings	1. Methods of Seawater Analysis, 1983, 1999 – Grasshoff, K., Ehrhardt, M. and Kremling, K.; Verlag Chemie, Weinheim. 2. Organic Reaction Mechanisms, 1997 - Knipe, A. C. and Watts, W. E., John Wiley and Sons, New York. 3. A Manual of Chemical and Biological Methods for Seawater Analysis, 1984 – Parsons, T. R., Maita, Y. and Lalli, C. M.; Pergamon Press, Oxford. 4. Aquatic Chemistry, 1981, 1996 – Stumm, W. and Morgan, J. J., John Wiley and Sons, New York. 5. Aquatic Surface Chemistry, 1987 – Stumm W., John Wiley and Sons, New York. 6. Practical Estuarine Chemistry, 1985 - Head, P.C., Cambridge University Press, Cambridge. 7. A simplified resorcinol method for direct spectrophotometric determination of nitrate in seawater, 2006 - Zhang, J. Z. and Fischer, C. J. Marine Chemistry, 99, 220 – 226. 8. Phosphorus release from lake sediments: effects of pH, temperature and dissolved oxygen, 2014 - Wu, Y., Wen, Y., Zhou, J. and Wu, Y., KSCE Journal of Civil Engineering, 18, 323 – 329. 9. The effect of pH on the release of phosphorus from Potomac estuary sediments: Implications for blue-green algal blooms, 1991 - Seitzinger, S. P., Estuarine, Coastal and Shelf Science, 33, 409-418. 10. Emission of carbon dioxide from a tropical estuarine system, Goa, India, 2001 - Sarma, V.V.S.S., Dileep Kumar, M. and Manerikar, M., Geophysical Research Letters, 28, 1239-1242. 11. Chemistry of dissolved inorganic carbon in estuarine and coastal brackish waters, 1975 - Mook, W.G. and Koene, B.K.S., Estuarine, Coastal and Marine Science 3, 325-336. 12. Sorption model for dissolved and leachable particulate Al in the Great Ouse estuary, England, 2012 - Upadhyay, S., Aquatic Geochemistry, 18, 243-262.	
Learning Outcomes	1. Develop analytical skills to determine the concentrations of various chemical parameters, such as sulphate, thiosulphate, bromide, urea and carbohydrates in seawater/aqueous systems. 2. Apply techniques to seawater/natural waters to study the biogeochemistry of the marine environment/aquatic systems.	