

**Programme:** M.Sc. (Marine Sciences)

**Course Code:** MSO 368

**Title of the Course:** Bioaccumulation and Phytoremediation Practical

**Number of Credits:** 01

**Effective from AY:** June 2018-19

<b>Prerequisites for the course</b>	Students undergoing course in any branch of Marine Sciences.	
<b>Objective</b>	This course introduces experiments to determine metal concentration in sediments, biota and mangroves to understand metal accumulation process and metal remediation potential of mangroves.	
<b>Content</b>	<ol style="list-style-type: none"><li>1. Digestion and chemical speciation of metals in sediments (Exchangeable, carbonate, Fe-Mn oxide, organic/sulphide and residual bound metals) (13 hrs; Ref 3, 4, 5)</li><li>2. Estimation of Mn, Co, Ni in sediments by flame AAS method (6 hrs; Ref 1, 2, 3, 4, 5)</li><li>3. Digestion of tissues of biota (5 hrs; Ref 5, 6, 7)</li><li>4. Estimation of Mn, Co, Ni in biota by flame AAS method (6 hrs; Ref 5, 6, 7)</li><li>5. Digestion of mangrove tissues (5 hrs; Ref 5, 8, 9)</li><li>6. Estimation of Mn, Co, Ni in mangrove tissue samples (6 hrs; Ref 5, 8, 9)</li></ol>	24 hours
<b>Pedagogy</b>	Field studies / Laboratory experiments / Interpretations	
<b>References / Readings</b>	<ol style="list-style-type: none"><li>1. Analytical chemistry of seawater, 1975 – Riley J. P. In Chemical Oceanography, J.P. Riley and G. Skirrow (eds.), Vol. 3, Academic Press London.</li><li>2. Methods of seawater analysis, 1983 – Grasshoff K., M. Ehrhardt and K. Kremling (eds.), Verlag Chemie, Weinheim, 419.</li><li>3. Manual for geochemical analysis of marine sediments and suspended particulate matter, 1977 Loring , D. H. and Rantala, R. T. T., Fish. Mar. Serv. Dev. Technical Report 700.</li><li>4. Sequential extraction procedure for the speciation of particulate trace metals, 1979 Tessier, A., Campbell, P. G. C. and Bisson, M., Analytical Chemistry, 51(7):844-851, American Chemical Society.</li><li>5. Trace metals in a tropical mangrove wetland, 2018 Sarkar, S. K., Springer Nature Singapore Pte Ltd.</li><li>6. Temporal and spatial variation on heavy metal concentrations in the bivalve Perna perna (Linnaeus, 1758) on the northern coast of Rio de Janeiro state, Brazil, 2004 Ferreira, G.A., Machado, A.L.S., Zalmin, I.R., Brazilian Archives of Biology and Technology 47:319-327.</li><li>7. Heavy metals in Patella caerulea (mollusca, gastropoda) in polluted and non-polluted areas from the Iskenderun Gulf (Mediterranean Turkey), 2010 Yuzeroglu, T. A., Gok, G., Cogun, H. Y., Firat, O., Aslanyavrusu, S., Maruldali, O. and Kargin, F. Environmental Monitoring and Assessment 167(1-4):257-264.</li><li>8. Assessment of sediment quality in Avicennia marina-dominated embayments of Sydney Estuary: The potential use of pneumatophore (aerial roots) as a bio-indicator of trace metal contamination, 2014, Nath, B., Birch, G. and Chaudhuri, P., Science of the Total Environment 472:1010-1022.</li><li>9. Toxicity, growth and accumulation relationships of copper lead and zinc in the grey mangrove Avicennia marina (Forsk.) Vierh, 2002, MacFarlane, G. R. and Burchett, M. D., Marine Environmental Research 54:65-84.</li></ol>	
<b>Learning Outcomes</b>	<ol style="list-style-type: none"><li>1. To understand field survey and sampling.</li><li>2. Ability to interpret data and link bioavailability with bioaccumulation.</li><li>3. To understand phytoremediation process.</li></ol>	