

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

**Course Code:** MSO 365

**Number of Credits:** 04

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

**Title of the Course:** Marine Pollution

<b>Prerequisites for the course:</b>	Marine Biology and Marine Chemistry	
<b>Objective:</b>	<ol style="list-style-type: none"><li>1. To understand the type of pollutants discharged into sea as a result of human activities, their sources and impact on marine life.</li><li>2. To study the addition of conservative (radioactive pollutants, trace metals and pesticides), non conservative pollutants (Oil and other organic wastes) and nutrient salts, their implications on human health and food resources and commercial interest.</li><li>3. Quantification of pollutant studies through suitable indicator organisms.</li><li>4. To study monitoring strategies of marine pollution through different approaches and assessment of pollution damage in order to understand</li></ol>	
<b>Content:</b>	Marine Pollution: Definition, categories of additions, Pollutant and its classification. Organic wastes: BOD, COD, dilution factor, Fluctuations in DO, Consequences of organic discharges to estuaries with examples; Thames and Mersey estuary; Consequences of sludge dumping at sea with reference to Thames and Firth of Clyde. Sewage treatment: Primary, Secondary and Tertiary treatment processes. Solid waste pollution: Classification and disposal of solid wastes.	12 hours
	Industrial pollution: sources, nature and their treatment processes with reference to wastes from paper and pulp and soap manufacturing industries. Marine corrosion: Definition, corrosion reactions, classification of corrosion, factors affecting corrosion of metals in sea water and prevention of marine corrosion. The state of some seas in the world (pollution aspect); The North sea, The Mediterranean sea and the Baltic sea.	12 hours
	Oil spills and cleanup: sources, major accidental spills, fate of spilled oil on the sea, consequences	
	of oil spills and treatment of oil spills. Pesticide pollution: inputs, fate in the sea, factors affecting the bioaccumulation of pesticides, DDT-the most wide spread molecule, Impact of pesticides on the Environment, Mode of poisoning of pesticides, Methods to minimize pesticide pollution. Conservative pollutants: Measures of contamination, toxicity, measurement of toxicity, acute and chronic exposure, Detoxification. Metal pollution in coastal waters (Hg, Pb, Cd, Cu, Zn and Fe). The present status of coastal pollution in India and future strategies. Radioactive Pollution: Sources, Classification and effects of radiation; Protection and control from radiation: Maximum permissible dose concept, dose limits, Disposal of radioactive wastes; Beneficial aspects of radiation and food safety.	12 hours
	Indicator organisms: Criteria for selection of indicator organism: Quantification of pollution load, basic pre-requisites, response to different pollution load and time integration capacity, Macro algae, crustaceans and mollusks as indicator organisms for monitoring of trace metal pollution; Red tides : distribution, types of poisoning, effects and methods to minimize red tides in the sea. Monitoring strategies of marine pollution: Critical pathway approach and Mass balance approach. Standards in water quality: Assessment of pollution damage: The need, seriousness of damage, assessment of damage and problems of measuring impact.	12 hours
<b>Pedagogy:</b>	lectures/ tutorials/assignments/self-study	
<b>References/ Readings</b>	<ol style="list-style-type: none"><li>1. Chemical Oceanography (Vol: 3), 1975 - Riley J.P and Skirrow, G. (eds.), Academic press, New York.</li><li>2. The health of the oceans, 1976 - Goldberg, E.D. UNESCO Press.</li><li>3. Marine Pollution, 1986 - Clark, R.B. Oxford science Publications.</li><li>4. Quantitative aquatic biological indicators, 1980 - Phillips J.D.H. Applied Science Publishers.</li><li>5. Thermal and radioactive pollution, 1994 - Sharma, B.K and Kaur, H. Krishna Prakasham Mandir, Meerut.</li><li>6. Water Pollution, 1994 - Sharma, B. K and Kaur, H. Krishna Prakasham Mandir, Meerut.</li><li>7. Marine and offshore corrosion, 1985 - Chandler, K.A. Butter Worths, London.</li></ol>	
<b>Learning Outcomes</b>	<ol style="list-style-type: none"><li>1. The course helps in understanding the impact of various pollutants on marine ecosystem; it analyses the factors responsible for degradation and suggests suitable corrective measures around the world.</li><li>2. To create awareness among student, by information by educating them to safeguard the marine environment</li><li>3. The course further identify the factors responsible for causing marine pollution , to suggest policy measures to prevent marine pollution, to create sustainable marine environment and</li><li>4. To provide advisory and technical service to government and industry for pollution abatement.</li></ol>	