Programme: M. Sc. (Marine Sciences)
Course Code: MSO 369 **Title of the Course: Aerosol and Climate**
Number of Credits: 03
Effective from AY: June2018-19

Prerequisites for the course:	Students undergoing course in any branch of Marine Sciences.
Objective:	This course is introduced as an attempt to make students understand the significant role of aerosol on regional climate in particular and Global climate in general.

Content:	Introduction to aerosols – Aerosol motion – Stoke's law and setting velocity - Sun photometry – Multi-wavelength radiometer -estimation of aerosol optical depth (AOD)- Brownian motion and diffusion deposition-Brownian coagulation- Angstrom turbidity formula – Particle sizes and functions used to fit aerosol size distribution – The lognormal- gamma and power law functions- aerosol measurement network – ARFI and AERONET- Aerosol water uptake-Solubility and hygroscopicity - Hygroscopicity and cloud condensation nuclei (CCN) activity – Aerosol optical properties and Mie theory for spherical particles. Light absorbing black Carbon (BC) aerosol- Aerosol light scattering-absorption and extinction- Aethalometer - Quartz crystal microbalance (QCM) for size analysis – Identification of planetary boundary layer – In-situ production of aerosol -Shear and turbulence- estimation of Richardson number (Ri) - estimation of heat flux - sensible and latent- maritime and continental aerosol- land and sea breeze - Long range transport of aerosol. Retrieval of aerosol optical depth from satellite data. Estimation of aerosol radiative forcing and atmospheric heating rate- implications to climate - present status of aerosol research in India and in the world. Atmosphere: Chemical and photochemical reactions in the atmosphere. Atmospheric trace constituents: Oxygen, sulphur containingcontaining compounds: sulfur dioxide, dimethyl sulphide, and carbonyl sulphide. Nitrogen containing compounds: nitrous oxide, nitrogen oxides and ammonia. Carbon containing compounds: hydrocarbons, volatile organic compounds, carbon monoxide and carbon dioxide. Halogencontaining compounds: Methyl chloride, methyl bromide. Green house effect/Global warming; biomass burning and air pollution.	12 hours 12 hours 12 hours
Pedagogy:	Since it is a theory component, entire course is taught in the class. However, to get a strong understanding seminar topics, other than from the syllabus are given to students.	
References/ Readings	1. Atmospheric Chemistry and Physics, 2006 - From air pollution to Climate change. Seinfeld. John H; Pandis, Spyros N, John Wiley. 2. Radiation and cloud processes in the atmosphere, 2006 - Theory, Observation and modeling, Kuo-Nan Liou, Oxford University Press. 3. Atmospheric aerosol properties, 2006 - Kondrateyev, K.Y, Ivlev L.S, Krapivin, V.F, Varostos C.A, Springer Praxis Book. 4. An Introduction to Boundary Layer Meteorology, 1999 – Roland B. Stull, Kluwer, Academic Publishers. 5. Environmental Chemistry, 2006- Anil Kumar Dey, New Age International publishers, West Bengal.	
Learning Outcomes	The knowledge they gain from the course will be an investment for their post-PG research as aerosol science/research is an emerging field.	