Course Type	Course Code	Name of Course	L	T	P	Credit
DE	ESD511	Aerosols in the Atmosphere	3	0	0	9

Course Objective

This course aims to introduce the fundamentals of atmospheric aerosols associated with air quality, climate and health effects. This course is conceptualized to prepare students for research and future careers in the field of air quality and atmospheric science.

Learning Outcomes

Upon successful completion of this course, students should:

- Know about the physical, chemical and optical characteristics of atmospheric aerosols
- Understand the severity of aerosol and research aspects in context of air quality, climate and health effects
- Know about monitoring techniques and statistical modelling tools for source identification

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Aerosol size Distribution:** Size distribution of aerosol based on number, mass, surface and volume; Properties of size distribution and lognormal distribution; Formation pathways; Effect of landscape/sources on size distribution; Lifetime of aerosol	5	Understand about the physical properties of aerosol and how land use pattern controls the overall aerosol size distribution
2	**Aerosol Chemical and Optical characteristics:** Inorganics, dust, trace metals, black carbon, organic aerosol, polyaromatic hydrocarbons; Interaction between gases and particles; Aerosol chemistry; Effect of meteorology and seasons; Light absorption and scattering; Cloud condensation nuclei and biological aerosols; Toxicity	10	Acquire knowledge about the chemical characterization of aerosol, atmospheric processes that modify their properties and role of different chemicals components in the atmosphere
3	**Aerosol Effects:** Visibility impairment; Implications for climate and human health, Wintertime fog formation; Acid rain	5	Develop understanding about the aerosol effects on air quality, climate and health effects
4	**Measurement and Monitoring:** Filter measurements and speciation; Analytical Instruments for chemical, size and optical components of aerosol; Real time monitoring; Sampling protocol for representative site selection; Exposure to satellite monitoring and visualization tools	10	Acquire information about the different aerosol measurement and monitoring techniques
5	**Source apportionment:** Source fingerprints; Enrichment factor; Principal component analysis, Positive matrix factorization; Wind rose, Potential source contributing function, Concentration weighted trajectories	9	Knowledge about the different receptor modelling tools utilized for finding probable sources of atmospheric aerosols and their origin

Text Books:

- John H. Seinfeld and Spyros N Pandis - Atmospheric Chemistry and Physics, From Air Pollution to Climate Change-Wiley (2016).
- R M Harrison, R E Hester, Xavier Querol- Airborne Particulate Matter: Sources, Atmospheric Processes and Health
- Daniel J. Jacob - Introduction to atmospheric chemistry-Princeton univ press (1999)

References:

- Peter V. Hobbs - Introduction to Atmospheric Chemistry-Cambridge University Press (2000).
- Judith G. Chow and John G. Watson- Guideline on Speciated Particulate Monitoring
- Charles E. Kolb and Douglas R. Worsnop- Chemistry and Composition of Atmospheric Aerosol Particles