**Course title:** Climate lab

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| **Course code:** NRC 107 | **No. of credits:** 2 | **L-T-P:** 7.5-0-45 | **Learning hours:** 53 |

**Pre-requisite course code and title (if any):**

**Department:** Energy and Environment

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| **Course coordinator(s):** Dr Kamna Sachdeva | **Course instructor(s):** Dr Kamna Sachdeva |

**Contact details:** kamna.sachdeva@terisas.res.in

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| **Course type**: Core | **Course offered in:** Semester 1 |

**Course description**

The course is intended to provide practical knowledge to the students of MSc climate science and policy related to air pollution, water pollution and combustion processes. Also under this course students will be taught to study thermodynamic graphs to understand microphysical processes of the atmosphere.

**Course objectives**

- The course is intended to provide practical knowledge related to air pollution, water pollution & combustion processes.
- To provide basic practical understanding related to meteorology and its relationship with climates studies

**Course content**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1. | Introduction to Sample collection techniques and error calculations for water, soil and air system | 5 | | |
| 2. | Air<br>**Ambient monitoring:** SPM, RSPM, SOx, NOx<br>Data analysis and interpretation | | | 10 |
| 3. | **Water and soil**<br>a. Dissolved oxygen: General considerations, environmental significance of dissolved oxygen, collection of samples for determination of dissolved oxygen, methods of determination.<br>b. BOD: General consideration, nature of BOD reaction, method of<br>c. measurement, application of data<br>d. COD: General consideration, methods of measurement,<br>e. application of data in environmental science<br>f. Soil: soil moisture and organic carbon determination | | | 20 |
| 4. | **Combustion**<br>Calorific value determination and fuel efficiency calculations | | | 5 |
| 5. | **Thermodynamic diagrams**<br>Introduction of concepts of thermodynamic diagrams and its application in climate studies. Identification clouds and its temperature using satellite images. | 2.5 | | 10 |
| | | **7.5** | | **45** |

**Evaluation criteria**

- Test 1: Viva test: 40% (end term examination based on entire syllabus and class discussions)
- Test 2: Practical exam 40% (hands on practical and written test, will be performed in the lab)
- Test 3: 20% (spotting, lab file assessment and class attendance)

**Learning outcomes**

- Students will be able to relate connection between environmental pollution and climate change issues (module 1to 4)
- Able to read basic thermodynamic diagrams for few atmospheric phenomenon and extreme events (module 5)

**Pedagogical approach: theory, practical demonstration and performance, satellite images and discussion of available tools to read satellite images more accurately**

**Materials**

**Required Text**

1. Standard Methods for the Examination of Water and Wastewater Published by APHA 15th ed.
2. Thomas D.P. (2003) Handbook of Weather, Climate and Water: Dynamics, Climate, Physical Meteorology, Weather Systems and Measurements, John Wiley and Sons, USA.

**Suggested Readings**

1. For heat of combustion tables of various fuels and organic compounds on Wikipedia, see: http://en.wikipedia.org/wiki/Heat_of_combustion#Heat_of_ combustion_tables
2. Harrison T., Shallcross D. and Henshaw S. (2006) Detecting $CO_2$–the Hunt for Greenhouse-gas Emissions, *Chemistry Review*, **15,** 27-30.
3. Marshall J. and Plumb R.A. (2001) Atmosphere, Ocean and Climate, *Elsevier*, Amsterdam.
4. Seinfeld J.H. (1986) Atmospheric Chemistry and Physics of Air Pollution, *John Wiley & Sons*.
5. Wallace and Hobbs (2006) Atmospheric Science-an Introductory Survey, Second Edition, *Academic Press Elsevier.*

**Journals**

1. Combustion and Flame
2. Environmental Pollution
3. Environmental Science and Technology

**Additional information (if any)**

**Student responsibilities**

The students are expected to submit assignments in time and come prepared with readings when provided.

**Course Reviewers**

The course is reviewed by the following experts.

1. Dr Umesh Kulshreshta, Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi.
2. Dr. Minal Pathak, CEPT, Ahemdabad, Gujarat.
3. Dr. Pankaj Mehta, Faculty, Jammu University, Jammu, Jammu and Kashmir.