

<b>Course title:</b> Environmental Monitoring Laboratory				
<b>Course code:</b> NRE 138	<b>No. of credits:</b> 3	<b>L-T-P:</b> 15-0-60	<b>Learning hours:</b> 75	
<b>Pre-requisite course code and title (if any):</b> Fundamental Knowledge of Elementary Chemistry				
<b>Department:</b> Department of Energy and Environment				
<b>Course coordinator:</b>		<b>Course instructor:</b> Dr Kamna Sachdeva		
<b>Contact details:</b> kamna.sachdeva@terisas.ac.in				
<b>Course type:</b> Core		<b>Course offered in:</b> Semester 1		
<b>Course Description</b> The course is designed to develop sampling and analytical skills of the students which are required in environmental monitoring. Through this course, the students will be able to perform quantitative analysis of various physical, chemical and biological parameters involved in water, air, soil and microbiology research. The students will be exposed to various standard protocols used in environmental monitoring. This course will serve as foundation course for all the advance courses offered in subsequent semesters. The course will also be giving an opportunity to the students to learn the theory and to develop their practical skills to use the contemporary tools and techniques required for environmental impact assessment.				
<b>Course objectives</b> 1. The course is designed to develop sampling and analytical skills of the students which are required in environmental monitoring 2. The students will be exposed to various standard protocols used in environmental monitoring.				
<b>Course content</b>				
Module	Topic	L	T	P
1.	<b>Water and soil analysis</b> Introduction, sampling techniques and <b>introduction of QC and QA methods</b> , basic concept of quantitative techniques, instrument methods of analysis, standard solutions <b>Acidity and Alkalinity:</b> Sources and nature, environmental significance, methods of measurement, Application of data spare <b>Hardness:</b> General considerations; causes and sources, environmental significance, methods of determination, application of data in environmental science <b>Chlorides:</b> General considerations; causes and sources, environmental significance, methods of determination, application of data in environmental science <b>Solids:</b> Dissolved and undissolved solids, settleable solids, turbidity and Jar test, methods of determination, environmental significance, SVI, application of data	4  1  1  1  1		  4  4  4  4
2.	<b>Dissolved oxygen:</b> General considerations, environmental significance of dissolved oxygen, collection of samples for determination of dissolved oxygen, methods of determination. <b>BOD:</b> General consideration, nature of BOD reaction, method of measurement, application of data and introduction of kinetics to calculate ultimate BOD from BOD <sub>5</sub> <b>COD:</b> General consideration, methods of measurement, application of data in environmental science	1  1  1		4  5  4  4

	<b>Sulphates:</b> General considerations; causes and source, environmental significance, methods of determination, application of data in environmental science <b>Soil analysis:</b> moisture & pH determination, organic content determination (Walkly black method) and iron content analysis	1 1		8
3.	<b>Air sampling and monitoring</b> Sampling techniques and Ambient monitoring: SPM, RSPM, SO <sub>x</sub> , NO <sub>x</sub> , principles involved in the methods of measurements, calibration of methods and analyzers, data analysis and interpretation	1		12
4.	<b>Microbiology</b> Understanding of indicators of faecal contamination and the concept of indicator organisms; coliform bacteria count and its sampling, introduction of MPN method and its environmental relevance	1		7
	<b>Total</b>	<b>15</b>		<b>60</b>
<b>Evaluation criteria</b>				
<ul style="list-style-type: none"> <li>▪ Test 1: Viva: 30% (Module 1-4)</li> <li>▪ Test2: Practical and records: 50% (Module 1-4)</li> <li>▪ Test 3: Project Work: 20% (practical application of learned practical's-students need has to present any one Environmental problem and suggest how to assess is impact and magnitude using knowledge gained during the practical class)</li> </ul>				
<b>Learning outcomes</b>				
<ul style="list-style-type: none"> <li>• Students will be trained in analytical and conceptual skills required for environmental research (water, soil and air. (Test 1 and 2)</li> <li>• Students will be able to correlate environmental impacts and field processes (test 3)</li> </ul>				
<b>Pedagogical approach</b>				
<b>Materials</b>				
Required text				
<ol style="list-style-type: none"> <li>1. Radojevic M. and Valdimir N.B. (2006) <i>Practical Environmental Analysis</i>, RSC publishing.</li> <li>2. APHA (1980) Standard Methods for the Examination of Water and Wastewater Published by American Public Health Association, 15<sup>th</sup> ed.</li> </ol>				
Suggested readings				
<ol style="list-style-type: none"> <li>1. Kim Y.J. and Platt U. (Eds.) (2008) <i>Advanced Environmental Monitoring</i>, XXII, 420 p. Springer.</li> <li>2. Laboratory Analytical Techniques Series (LATS), published by CPCB.</li> <li>3. Roa M. (2008) <i>Environmental Science Activities Kit</i>, Jossey-Bas.</li> <li>4. Wagner T.P. and Robert S. (2009) <i>Environmental Science: Active Learning Laboratories and Applied Problem Sets</i>, 2nd Edition, Wiley.</li> <li>5. Wells E. (2009) <i>Lab Manual for Environmental Science</i>, Cengage Learning</li> </ol>				
Case studies				
Websites				
Journals				
<ol style="list-style-type: none"> <li>1. Environmental Management</li> </ol>				

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| 2. Environmental Pollution<br>3. Environmental Science and Technology |
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<b>Additional information (if any)</b>
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<b>Student responsibilities</b>
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Attendance, feedback, discipline, guest faculty etc
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