

<b>Course title:</b> Environmental Health and Risk Assessment				
<b>Course code:</b> NRE 144		<b>No. of credits:</b> 3	<b>L-T-P:</b> 31-14-0	<b>Learning hours:</b> 45
<b>Pre-requisite course code and title (if any):</b>				
<b>Department:</b> Natural and Applied Sciences				
<b>Course coordinator(s):</b>			<b>Course instructor(s):</b> Dr Ranjana Ray Chaudhuri	
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<b>Course type:</b> Elective			<b>Course offered in:</b> Semester 2	
<b>Course description</b> The Environmental Health Risk Assessment course provides students with the technical and policy knowledge required to identify, assess and address important and emerging environmental health issues to reduce environmental risks to public health.  The course is structured primarily on the EPA structures of assessment which is known as the most conservative method of qualitative and quantitative risk calculation. While the assessment frameworks are primarily international, Indian contexts will be explored through the case study should students wish to pursue it within national regulation.				
<b>Course objectives</b> <ul style="list-style-type: none"><li>• Develop a basic understanding of environmental health and risk assessment and its role within the risk management process.</li><li>• Develop a basic understanding of how to assess impact of pollution such as air pollution, water pollution on environment and human health.</li><li>• To learn about different risk assessment formats and their use in environmental health studies</li><li>• To learn about hazard identification and dose response calculations</li><li>• To understand and use epidemiological data, case study analysis to understand various methods of risk assessment</li></ul>				
<b>Course content</b>				
<b>Module</b>	<b>Topic</b>	<b>L</b>	<b>T</b>	<b>P</b>
1.	<b>Introduction to Environmental Health and Risk Assessment</b> <ul style="list-style-type: none"><li>• Risk assessment, epidemiology, toxicology</li><li>• Environmental health and occupational health</li><li>• Hazard waste and environmental remediation</li><li>• Indian scenario<ul style="list-style-type: none"><li>○ Current framework (MoEF, CPCB, SPCB)</li><li>○ Standards</li><li>○ Relevant legislation: (NEPA, NGT etc)</li></ul></li></ul>	5	2	
2.	<b>Hazard Identification</b> <ul style="list-style-type: none"><li>• Background information, past site knowledge</li><li>• Record of contamination</li><li>• Sampling plans</li><li>• Toxicity Profiles</li><li>• Classification as ‘contaminant of concern’</li></ul>	5	3	
3.	<b>Guest Lecture: Blacksmith Institute “Indian scenario – Index”</b>	2		
4.	<b>Dose Response Assessment</b> <ul style="list-style-type: none"><li>• Threshold Effect: NOAEL, LOAEL and UFs, RFD/Cs)</li><li>• Carcinogenic effects: Group A-E</li><li>• Relative Absorption Factors:</li><li>• Groups of Chemicals [PAHs, Dioxins, PCBs, etc...]</li><li>• Recommended format</li></ul>	5	2	

5.	<b>Guest Lecture: Toxicology applications</b>	2		
6.	<b>Exposure Assessment</b> <ul style="list-style-type: none"> <li>• Development of Exposure Profiles: In-continuation to sampling plan</li> <li>• Basic Approach/Assumptions: Conservative approach, 90<sup>th</sup> percentile.</li> <li>• Quantitative Estimations of Exposure: ADD, LADD, Exposure factors</li> <li>• Exposure Equations</li> </ul>	6	6	
7.	<b>Risk Characterization</b> <ul style="list-style-type: none"> <li>• Non-cancer Risk: HI</li> <li>• Cancer Risk: ELCR (SF, UF)</li> <li>• Comparison to Applicable or Suitably Analogous Public Health Standards: EPA, WHO, ADB guidelines</li> <li>• Risk characterization conclusions</li> </ul>	4	1	
8.	<b>Uncertainty Analysis</b>	2		
	<b>Total</b>	<b>31</b>	<b>14</b>	
<b>Evaluation criteria</b> <ul style="list-style-type: none"> <li>▪ Test 1: 25% (written test)</li> <li>▪ Test 2: 25% (written test)</li> <li>▪ Assignments: 10% (term paper)</li> <li>▪ Test 3: 40% (written test)</li> </ul>				
<b>Learning outcomes</b> <ul style="list-style-type: none"> <li>▪ After attending the course students shall have gained knowledge and understanding of the methods and processes employed in environmental health and risk assessment. (Module 1-7)</li> <li>▪ The students shall also have gained a professional attitude in the interpretation of epidemiological and toxicological studies for use in environmental health and risk assessment. (Module 1-7) <ul style="list-style-type: none"> <li>• To understand key principles of environmental health risk characterization</li> <li>• Should be able to assess risk due to carcinogens, analyse various methods of risk assessment</li> <li>• Should be able to understand exposure modelling, point estimate and probability modelling</li> </ul> </li> </ul>				
<b>Pedagogical approach</b>				
<b>Reading List</b> <ul style="list-style-type: none"> <li>• Asante-Duah, D.K. (1998). <i>Risk Assessment in Environmental Management</i>. John Wiley &amp; Sons, Chichester, England.</li> <li>• Asante-Duah, D.K. (2017). <i>Public Health Risk Assessment for Human Exposure to Chemicals</i>. Springer, Dordrecht, The Netherlands.</li> <li>• Theodore, L. and Dupont, R.R. (2012). <i>Environmental Health and Hazard Risk Assessment Principles and Calculations</i>. CRC Press, Taylor &amp; Francis Group.</li> </ul>				
<b>Journals</b>				
1. Blacksmith Institute Journal of Health and Pollution				
<b>Advanced Reading Material</b>				
<b>Additional information (if any)</b>				
<b>Student responsibilities</b>				
The students are expected to submit assignments in time and come prepared with readings when provided.				