

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	ESD405	Climate Vulnerability and Risk Analysis	3	0	0	9
Course Objective						
- This course has been designed to make the students conversant with the fundamental concepts of vulnerability and risk assessment, specifically focusing on the climate change aspects. - The objective of the course is to provide the students with the background of risk analysis, along with their different components, viz., hazard, exposure and vulnerability. This course will be focusing on the methods to obtain the climate risk indices, focusing on the social, economic and technological aspects. Students will also learn how to apply risk analysis in real-world settings.						
Learning Outcomes						
Upon successful completion of this course, students will: - Understand the basic concepts of risk and vulnerability assessment and its different definitions. - Understand the probability theory/probabilistic modeling and how to interpret these, in the evaluation of risk. - Learn how to quantify the natural/climate hazards, which is a component of risk analysis, with real-life example – specifically focusing on the Indian scenario. - Understand the issues surrounding the use of risk analysis in decision making						
Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome			
1	Conceptual Framework of Vulnerability and Risk analysis from the perspective of climate change: Concept of climate change and the factors affecting the climate change – specifically focused on India's aspects. Concept of vulnerability and risk in terms of climate change scenarios, Evolution of definition/concept of vulnerability and risk from Intergovernmental Panel on Climate Change (IPCC) Assessment reports (AR3 and AR5).	7	Learn the concept of vulnerability and risk assessment in climate change adaptation along with the disaster risk governance.			
2	Hazard Component of Risk analysis: Natural disasters such as precipitation extremes, droughts, heatwaves, and cyclones. To categorize these hazards, a comprehensive statistical approach – Extreme Value Analysis, such as Generalized Extreme Value Theory (GEV) and Generalized Pareto Distribution (GPD). Role of early warning system of the hazards in risk analysis.	9	To properly/improve the understanding on the hazard dimensions of Risk, their quantification, and their role in the nation's disaster management			
3	Exposure component of Risk analysis – concept and the exposure modeling of natural disasters, such as precipitation extremes, droughts, heatwaves, cyclones.	6	To properly/improve the understanding on the exposure dimensions of Risk, their quantification, and their role in the nation's disaster management			
4	Qualitative and Quantitative risk analysis: The key concepts of qualitative and quantitative natural disaster risk analyses emphasize the risks to different sectors – ranging from social to socio-economic aspects – with a hands-on example	9	Learn some important facets of methodologies pertaining to Risk analysis			
5	Decision making from assimilating the Disaster Risk: Introduction, Methodological Approach, Differences between single – and Multiple – objective decision making, Example problems.	8	To provide an overview of the principles of risk management and related decision- making. To introduce some of the commonly used mathematical techniques.			
6	Case Studies: Risk Modelling, Assessment and Management of Lahar Flow Treat and to Indian Agricultural Sector.	3	Learn the complete aspects of Risk modelling and its management with real-life examples			

Text Books:

1. Daisy Mathews, Effects and Risks of Climate Change, Callisto Reference
2. Yacov Y Haimes, Risk assessment, modeling management, John Wiley and Sons

Reference Books:

3. Tim Bedford and Roger M. Cooke, Probabilistic Risk Analysis: Foundations and Method, Cambridge University Press
4. Daniel M Byrd and Richard Cothorn, Introduction to risk analysis: a systematic approach to science-based decision making, Rockville, MD: Government Institutes