

<b>Course Title:</b> Hazards and Disaster Risk Reduction				
<b>Course code:</b> UES 308	<b>No. of credits:</b> 4	<b>L-T-P:</b> 44-16-0	<b>Learning hours:</b> 60	
<b>Pre-requisite course code and title (if any):</b> None				
<b>Department:</b> Natural and Applied Sciences				
<b>Course coordinator:</b>		<b>Course instructor:</b>		
<b>Contact details:</b>				
<b>Course type:</b> Major		<b>Course offered in:</b> Semester 6		
<b>Course Description</b> Natural hazards are an outcome of dynamic planetary processes that may impact human society. Additionally, there are several hazards that are human-induced and arise out of various activities. When they intersect with communities, such hazards often lead to disasters. Climate change is known to increase disaster intensities and frequency by aggravating hazards, necessitating a deeper understating of these processes as well as the factors determining vulnerability of communities and their resources. This course introduces students to the processes behind these hazards as well as about the social and economic aspects of associated disasters. It will enable them to understand the strategies and policies that enable societies to respond to these disasters, recover, build resilience and reduce their impacts in future.				
<b>Course objectives</b> The course aims to build the following basic understanding among students: <ul style="list-style-type: none"> <li>To provide foundational knowledge on hazards, their types, risks and impacts.</li> <li>To build awareness of the nexus between vulnerabilities in human societies and hazards leading to aggravated disasters.</li> <li>To develop an understanding of practical approaches and measures for effective disaster management, and strategies for augmenting preparedness, response and recovery, and risk reduction.</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 Hazards and Disasters</b>			
	Being an introductory module, this builds a general foundation by highlighting the following basic concepts relevant to NRM:  Basic concepts and terminologies – hazard, risk, sensitivity, vulnerability, disaster, mitigation, adaptation, resilience Brief introduction to natural hazards and associated issues – definition, global distribution; Disasters – damage (impacts), link to vulnerabilities; disaster vulnerability profile of India; Link between climate change and extreme weather events, and its implications on disaster risk	10	4	0
2	<b>Categorization of Hazards</b>			
	This module introduces key aspects of different categories of hazards, focusing on understanding their specific causes, classification and impacts. The module contents are as follows:  Geological and geophysical hazards: earthquakes, volcanoes, landslides, tsunamis Hydro-meteorological hazards: floods, droughts, cyclones, heatwaves, lightning Biological hazards: epidemics, pandemics Environmental and human-induced hazards: forest fires, dam or reservoir-induced seismicity, radioactive or nuclear hazards, chemical or oil spills, human-induced technological hazards and their cascading effects on environment	10	4	0
3	<b>Case Studies – Historical Disasters</b>			
	This module introduces students to historical disasters and lessons learned. The contents of this module are as follows:			

	Analysis of major historical disasters, lessons learned from failures in disaster management – Banqiao dam failure (1975), Bhopal gas tragedy (1984), Exxon Valdez oil spill (1989), Kobe earthquake (1995), Leh flash floods (2010), Bhuj earthquake (2001), Siberian taiga fires (2003), Indian ocean tsunami (2004), Kashmir earthquake (2005), Hurricane Katrina (2005), Mumbai floods (2005), Fukushima nuclear disaster (2011), Cyclone Phailin (2013), Uttarakhand floods (2013), Uttarakhand forest fires (2016)	8	4	0
4	<b>Interventions, Best Practices and Disaster Risk Reduction</b>			
	<p>This module exposes students to various dimensions, planning aspects, overall framework for managing disasters, current initiatives aimed at developing practical and innovative solutions for disaster risk reduction. It also enables them to develop an understanding of the problems currently being faced during their implementation. The contents of this module are as follows:</p> <p>Disaster management cycle – rescue, relief, rehabilitation, recovery and reconstruction, prevention, mitigation and preparedness; prediction and early warning, mitigation strategies for different categories of disasters; risk assessment and risk reduction; post-disaster needs assessment; institutional frameworks and policies (national and international) - Disaster Management Act 2005, Hyogo Framework for Action (2005-2015), Sendai Framework for Disaster Risk Reduction (2015-2030); funding for disaster resilience, community-based and technology-driven approaches for generating awareness and capacity building; adaptation strategies under changing climatic regimes; best practices in risk reduction and building resilience, technological innovations especially in early warning systems, data driven response and decision support systems; successful global initiatives – India, Indonesia, USA, Japan, Indian Ocean Tsunami Warning System</p>	16	4	0
	<b>Total</b>	44	16	0
<b>Evaluation criteria</b>				
<ul style="list-style-type: none"> <li>• Minor Test 1: Written test [at the end of teaching of module 1] -- 15%</li> <li>• Minor Test 2: Written test [at the end of teaching of module 2] -- 15%</li> <li>• Major Test: Written test [at the end of the semester, full syllabus] -- 40%</li> <li>• Assignment and Presentation -- 30%</li> </ul>				
<b>Learning outcomes</b>				
<p>Upon completion of the course, the students will be able to</p> <ul style="list-style-type: none"> <li>• understand and analyze the factors contributing to disaster and associated risks. [Minor Tests, Major Test]</li> <li>• think and develop holistic strategies for better management of disasters by synthesize learnings from all the modules [Tests, Assignment and Presentation]</li> <li>• developed skills to formulate practical solutions by articulating the learnings from case studies. [Assignment and Presentation]</li> </ul>				
<b>Pedagogical approach</b>				
<ul style="list-style-type: none"> <li>• The course will be delivered through lectures, tutorials and discussion of case studies.</li> <li>• The course will also include guided assignments and associated student presentations.</li> </ul>				
<b>Reading resources</b>				
<ul style="list-style-type: none"> <li>• Birkman, J. (2009). <i>Measuring vulnerability to natural hazards</i>. The Energy and Resources Institute.</li> <li>• Collins, L. R. (2000). <i>Disaster management and preparedness</i>. CRC Press.</li> <li>• Jat, B. C. (2008). <i>Natural hazards and disaster management</i>. M D Publications.</li> <li>• Jha, M. K. (2010). <i>Natural and anthropogenic disasters: Vulnerability, preparedness, and mitigation</i>. Capital Publishing Company.</li> <li>• Kapur, A. (2010). <i>Vulnerable India: A geographical study of disasters</i>. SAGE Publications.</li> <li>• Kelman, I., Mercer, J., &amp; Gaillard, J. C. (Eds.). (2020). <i>The Routledge handbook of disaster risk reduction including climate change adaptation</i>. Routledge.</li> <li>• Modh, S. (2009). <i>Introduction to disaster management</i>. Macmillan.</li> </ul>				

- National Institute of Disaster Management. (2015). *Uttarakhand disaster 2013*. National Institute of Disaster Management (NIDM), New Delhi.
- Pandey, R. K. (2023). *Disaster management in India: Policies, institutions, practices*. Routledge.
- Paul, B. K. (2011). *Environmental hazards and disasters: Contexts, perspectives and management*. Wiley-Blackwell.
- Pine, J. (2008). *Natural hazards analysis: Reducing the impact of disasters*. CRC Press.
- Pinkowski, J. (Ed.). (2008). *Disaster management handbook*. CRC Press.
- Singh, A. (Ed.). (2023). *International handbook of disaster research*. Springer Nature.
- Smith, K., Fearnley, C. J., Dixon, D., Bird, D. K., & Kelman, I. (2023). *Environmental hazards: Assessing risk and reducing disaster*. Routledge.
- van Oosterom, P., Zlatanova, S., & Fendel, E. (Eds.). (2006). *Geo-information for disaster management*. Springer.
- Victor Rajamanickam, G. (Ed.). (2006). *26th December 2004 tsunami: Causes, effects, remedial measures, pre and post tsunami disaster management, a geoscientific perspective*. New Academic Publishers.
- Wisner, B., Blaikie, P. M., Cannon, T., & Davis, I. (2003). *At risk: Natural hazards, people's vulnerability and disasters*. Routledge.

### **Student Responsibilities**

The students are required to come prepared with readings that are suggested during the class and ensure timely submission of assignments. They are also expected to participate and further strengthen their understanding of concepts through classroom discussions and case studies.

### **Course Designed By:**

- Dr Amit Singh, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

### **Course Reviewers**

The course is reviewed by following reviewers:

- Prof. PK Joshi, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi
- Dr. Satyanarayan Shashtri, Associate Professor, School of Ecology and Environment Studies, Nalanda University, Rajgir, Bihar