



This course has been designed with a view to help students in developing a comprehensive understanding and knowledge on vulnerability assessment. The main objectives of the course are: (i) To help students understand the concepts of risk, vulnerability, resilience, and vulnerability assessment methods, critically analyse them, (ii) To understand the basics to develop framework and recommendation for vulnerability assessment techniques, (iii) To help students guide through entire process of risk assessment using geospatial domain, and (iv) To understand and formulate requirements of hazard data and methods.



Activities	Learning outcomes	Assessment	Estimated workload (hours)	Self-Study (hours)
<b>In-class activities</b>				
Lectures and Presentations	Introduction to the concepts of Vulnerability. Key Terms and Definitions – Hazard, Vulnerability, Exposure, Coping Capacity and Resilience, Risk, <b>Antifragility</b> and related terms	Mid Semester Examination	04	04
Lectures and Presentations	Vulnerabilities of different systems (social, <b>environmental and ecological</b> ), tipping points in the Earth System, issues for developing countries.	Mid Semester Examination	04	04
Lectures and Presentations	Basics of vulnerability and risk assessment (concept of exposure, sensitivity, and adaptive capacity), methods for analysis, decision analysis, management of uncertainty, and analysis of inherent and chronic vulnerabilities as well as those related to extreme events and hazards.	Mid Semester Examination	08	08
Lectures and Presentations	Development of frameworks for vulnerability assessment. Integration of social and natural science perspective and approaches to	Mid Semester Examination	08	08



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	identify the purpose and focus of the vulnerability assessment (with the examples from different sectors). Qualitative to semi-quantitative methods to assess vulnerabilities to climate change.			
Lectures and Presentations	Introducing disaster risk assessment and management, and rebuilding on importance of geospatial data. Elements at risk, classification, infrastructure, critical facilities, <b>green and blue infrastructure</b> , demography and collection of related information. Sources and methods of obtaining spatial data for risk assessment and presentation for various types of hazards. Hazard profiling, multiple hazard mapping, and maximum usage of Internet search and acquiring open and free (low cost) data. Participatory GIS, spatial multi-criteria evaluation and decision-making – to include component of vulnerability assessment (social, physical, <b>environmental, ecological</b> and other).	End Semester Examination	08	08
Lectures and Presentations	Models for risk assessment and loss estimation. Qualitative and Quantitative risk assessment (including flood, seismic, landslide and technical risk assessment). Risk evaluation, cost benefit analysis and necessities for emergency planning and environmental impact assessment.	End Semester Examination	06	06
Lectures and Presentations	Spatial and holistic assessment of vulnerability (social, economic, environmental) to Natural Hazards (Case Studies) - Seismic Risk (Earthquakes and landslides), Floods, <b>Heat stress</b> , Drought, Forest fires, Coastal erosion.	End Semester Examination	06	06
<b>Independent work</b>				
Individual Assignments	Ability to interpret data, and to use the concepts, tools, and methods for communicating information	Individual Presentations	12	12



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<b>Total</b>			<b>56</b>	<b>56</b>
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## Grading

The students' performance will be based on the following:

- Quizzes/Surprise Test – 10%
- Mid Semester Examination – 30%
- End Semester Examination – 50%
- Individual Assignments – 10%

Grade	Grade Point	FGPA	Class/Division
A+	9	8.5 and above	High First Class
A	8	7.5 and above but less than 8.5	Middle First Class
A-	7	6.5 and above but less than 7.5	Lower First Class
B+	6	5.5 and above but less than 6.5	High Second Class
B	5	4.5 and above but less than 5.5	Middle Second Class
B-	4	3.5 and above but less than 4.5	Lower Second Class
C+	3		
C	2		
C-	1		
F	0		

Course Schedule: **Semester -I: July – December**

## Course Assignments

The Structure of Individual Assignments will be as follows:

- Book review on the given topic.
- Review of research articles and working paper with given objectives.

## Literature

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- Fang, W.H., et al. (2011). Integrated Risk Governance: data base, risk map and network platform. Beijing: Science Press.
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- Johnson, H. and Gheroghe, A.V. (2013). Antifragility Analysis and Measurement Framework for Systems of Systems. *Int. J. Disaster Risk Sci.* 2013, 4 (4): 159–168.
- Leary, N., et al. (2008). Climate change and vulnerability. Earthscan in the UK and USA.
- Marzocchi, W., et al. (2009). Principles of multi-risk assessment. Interaction amongst natural and man-induced risks. Brussels: European Communities.
- Nagoda, S. (2015). New discourses but same old development approaches ? Climate change adaptation policies , chronic food insecurity and development interventions in northwestern Nepal. *Global Environmental Change*, 35, 570–579. <https://doi.org/10.1016/j.gloenvcha.2015.08.014>
- Preston, B. L., Yuen, E. J., & Westaway, R. M. (2011). Putting vulnerability to climate change on the map: a review of approaches, benefits, and risks. *Sustainability Science*, 6(2), 177–202. <https://doi.org/10.1007/s11625-011-0129-1>
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- Tate, E. (2012). Social vulnerability indices: a comparative assessment using uncertainty and sensitivity analysis. *Natural Hazards*, 63(2), 325–347. <https://doi.org/10.1007/s11069-012-0152-2>
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