

Course Description

Upon Successful completion of this course, the student will be able to:

- **UNDERSTAND** the Geo-hazards, Plate tectonics and Global Distribution of Geo-hazards.
- **ACQUIRE** knowledge about the types of Geo-hazards, their management and early warning system.

COURSE OUTLINE**1. Introduction**

- Geo-hazards briefly
- Plate Tectonic and Plate Boundaries
- Global Distribution of Geo-hazards
- Folding, Faulting and Fault Lines

2. Types, Causes and Management of Geo-Hazards

- Earthquake
- Volcanoes
- Tsunami
- Landslide/Mass wasting
- Glacial Lake Outburst Floods (GLOFs)
- Associated Hazards

3. Geo-hazards Risk Assessment

- Hazard Inventory
- Susceptibility Mapping
- Elements at Risk and Exposure
- Evaluation of Risk

4. Lab Work: Prediction, Forecasting and Early Warning System for Geo-hazards

- Prediction of Forecasting techniques
- Exercise on Prediction and forecasting of Geo-hazards
- Field survey and visit to geophysical centres
- WMO, Tsunami and earthquake prediction/forecasting and networking
- Tsunami warning centres and shelters
- Early Warning System for Tsunami
- Early Warning System for Volcanos
- Early Warning System for GLOFs
- Early Warning System for Landslide
- Multi-hazard Early Warning System in Pakistan and field visit

Teaching Methodology

- Lecturing
- Written Assignments
- Interactive Sessions
- Seminar Lectures

- Audio-Visuals

Assessment Criteria:

1st Term (25%) Assignments/Quizzes and Presentations

Mid Term (35%) Written (Long Questions, Short Questions, MCQs)

Final Term (40%) Written (Long Questions, Short Questions, MCQs)

Textbooks:

1. Stevens, D. E. (2022). *Faults, fluids and geohazards at subduction zones*. United Kingdom: University of Southampton.
2. Li, P., Wu, J., Zhou, W., & LaMoreaux, J. W. (2023). *Hazard Hydrogeology*. Germany: Springer International Publishing.
3. Bonali, F. L., Mariotto, F. P., & Tsereteli, N. (2022). *Building Knowledge for Geohazard Assessment and Management in the Caucasus and Other Orogenic Regions*. Netherlands: Springer Netherlands.
4. Stephani, E. (2021). *Understanding Permafrost Dynamics and Geohazards with a Terrain-cryofacies Approach*. University of Alaska Fairbanks.
5. Pascale, F., D'Amico, S. (2023). *Geohazards and Disaster Risk Reduction: Multidisciplinary and Integrated Approaches*. Springer International Publishing.
6. Ramkumar, M. (2023). *Geological Hazards: Causes, Consequences and Methods of Containments*. India: NIPA.
7. Mittal, H., Kumar, P., Kumar, R., & Sandeep. (2023). *Geohazards: Analysis, Modelling and Forecasting*. Germany: Springer Nature Singapore.
8. Gao, J. (2023). *Remote Sensing of Natural Hazards*. CRC Press.