

Centre for Disaster Risk Reduction
Islamic University of Science and Technology

Syllabus for Ph.D. Entrance Test

Part-A

Research Methodology

Maximum Marks: 35

Section-I

Research Fundamentals:

Aims and objectives of research, Types of research – basic, novel and applied research. Tools for searching a research topic – books, journals, internet, E-Journal access, Google Scholar, SCOPUS, Wikipedia, Research Gate, etc. Research hypothesis, steps in research design. Literature Review and Research Gap. Publication of research, plagiarism, intellectual property rights. Papers indexing, impact factor, citation index, H-index. Dissemination of research results through conferences, workshops, report writing and publication of research papers.

Section-II

Research Methodology & Data Analysis:

Survey and techniques used in the field and laboratory for geological samples, methods of sampling, and analytical techniques. Collection of primary data from field, collection of air, water, soil, and rock samples. Preparation of samples for geotechnical investigation, microscopic examination, and chemical analysis. Analytical techniques and portable analytical techniques. Geospatial and Remote Sensing Techniques. Techniques of pre- and post-disaster needs assessment (PDNA). Data management. Interpretations of field and lab data. Statistical tools & analysis. Correlation, covariance, multivariate and factor analysis.

Section-III

Remote Sensing & Geographic Information System (GIS):

Electromagnetic spectrum and spectral signatures. Spectral reflectance of vegetation, soils, minerals, and rocks. Types of sensors, aerial photographs, satellite images, and radars. Resolution – spatial, spectral, radiometric, and temporal. Image interpretation, and correction. Image classification – supervised and unsupervised. Application of remote sensing techniques in mapping. Global Positioning Systems (GPS) – functions and operation. Components of GIS, GIS software packages. Geospatial analysis for disaster risk assessment with case studies on landslides, and floods. GIS for environmental applications like lake management, land use land cover, etc.

Books Recommended:

1. Wickham, H., and Wickham, H. (2016). Data analysis. Springer, pp.189-201.
2. Sukamolson, S. (2007). Fundamentals of quantitative research. Language Institute Chulalongkorn
3. University, 1(3), 1-20.
4. Singh, Y.K. (2006). Fundamental of research methodology and statistics. New Age International.
5. Andrew S. (2003). Environmental Modelling with GIS and Remote Sensing.

Section-I**Hazard, Vulnerability and Risk Assessment**

Hazard – estimation and effects. Vulnerability assessment. Risk – components and fundamentals of risk analysis. Seismic risk evaluation. Disaster – direct and indirect damages. Assessment for different disasters. Disaster mitigation – hazard monitoring, forecasting, and Early warning systems. Natural disasters, and their classification. Geological hazards – Earthquakes, Tsunamis, Liquefaction, Volcanic Eruptions, Landslides, Ground Subsidence, and Desertification. Hydrometeorological hazards – Floods, Glacial Lake Outburst Floods (GLOF), Droughts, Avalanches, Storms, Heat Waves, and Cold Waves. Geogenic groundwater contamination (arsenic, fluoride, etc.)

Section-II**Basics of Geomorphology**

The nature and scope of Geomorphology. Fundamental concepts – Catastrophism, and Uniformitarianism. Cycle of Erosion – Concept of Davis and Penck Model. Constitution of Earth's interior – Physical properties, and chemical composition of the Earth's crust. Geological Time Scale – Continental drift, and plate tectonics. Forces of Earth's crust and Earth's movements. Folds and Faults. Rocks – Formation and types. Weathering – Types, and agents. Topographic features and processes – Fluvial, Glacial, Aeolian, Karst, and Coastal. Mass wasting – Definition, types, and factors affecting mass wasting viz. lithology, topography, climate, vegetation, etc. Epeirogenesis and orogenesis. Soils – Formation, profiles, and types. Relevance of geomorphological studies in disaster studies. Cenozoic climate extremes.

Section-III**Engineering Geosciences**

Engineering properties of rocks and soils. Soil liquefaction and creep. Stress distribution in soil and foundation failure. Fundamental concepts of environmental geosciences. General relationship between landscape, climate, and biomass.

Section-IV**Governance in Disaster Risk Reduction (DRR)**

International Initiatives by United Nations – International Decade for Disaster Risk Reduction (DRR), Yokohama Strategy, Hyogo Framework for DRR (2005- 2013), Sendai Framework (2013-2030); Sustainable development Goals. Disaster Management Act of India. National Disaster Management Plan, 2016. Section 135 of Company Act, 2016. Corporate Social Responsibility, Scope, Utility, and Initiative taken for DRR. Disaster Economics. National, State, District, and Local Disaster Management Organizations. National and State Disaster Response Funds.

Books Recommended:

1. Keller, E.A. 2007. Introduction to environmental geology. Prentice-Hall, Inclusive.
2. Summerfield, M. A. (2014). Global geomorphology. Routledge.

3. Wisner, B., Gaillard, J. C., & Kelman, I. (2012). Handbook of hazards and disaster risk reduction. Routledge.