MAJOR- XI

DM-HMH-353	Hydro-meteorological Hazards	Cr. H. 3

Course Description

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

- **UNDERSTAND** the Hydro-meteorological processes and its linkages with natural hazards.
- **ACQUIRE** knowledge about types of Hydro-meteorological hazards, their management and early warning system.

COURSE OUTLINE

1. **Introduction**
   - Concepts of Meteorology and Hydrology
   - Hydrosphere and Atmospheric Circulations
   - Precipitation and its types
   - Drainage System and Surface Runoff
   - Hydro-meteorological Processes and Its Impacts

2. **Types, Causes and Management of Hydro-meteorological Hazards**
   - Cyclones
   - Thunderstorms, Windstorm, Hail, Snow Squalls, Cloud Bursting Sandstorms, Dust storms etc.
   - Floods/Flash Floods
   - Cold Wave/Intense Cold, Heat Waves/Excessive Heat etc.
   - Tide Waves, Tsunamis/Seismic Sea waves,
   - Drought
   - Forest fires/Bush fires
   - Smoke Volcanic Ash/ Lahar
   - Avalanches
   - Heat Wave
3. **Early Warning System for Hydro-Meteorological Hazards**
   - Core Components of Early Warning System
   - Stakeholders for Early Warning
   - Community Based Early Warning System
4. **Lab Work**
   - Weather data collection using weather instruments
   - Preparation of weather maps
   - Fluvial Morphology
   - River Training
   - Flood risk mapping
   - Flood Modelling
   - Weather RADAR and Satellite based weather forecast
   - Design of mitigation structures

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. Akhilesh Gupta, Anil Kumar Gupta, Manish Kumar Goyal (2022). Hydro-Meteorological Extremes and Disasters. (2022). Singapore: Springer Nature Singapore.
2. Paron, P. (2023). Hydro-Meteorological Hazards, Risks, and Disasters. Netherlands: Elsevier Science.
3. Akhilesh Gupta, Anil Kumar Gupta, Manish Kumar Goyal (2022). Hydro-Meteorological Extremes and Disasters. (2022). Singapore: Springer Nature Singapore.
4. Krebs, Robert E. (2003) The Basics of Earth Science. Greenwood, Westport, Connecticut, USA.
5. Raghunath, H.M. 2006. Hydrology Principles, Analysis and Design. New Age International Ltd.
6. Santosh Kumar Garg. 1985: Hydrology and water Resources Engineering. Khanna Publishers
7. Singh P. and Singh V.P. (2001) Snow and Glacier Hydrology, Kluwer Academic Publishers, PO Box 989, 3300 AZ Dordrecht, The Netherlands.
8. Sharp M., Keith S.R. and Tranter M. (Editors) (1998) Glacier Hydrology and Hydrochemistry, Wiley Publication
9. HYNDMAN, Donald and Hyndman, David (2010) Natural Hazards and Disasters. Brooks Cole, 3rd Revised Edition, Stamford, Connecticut, USA.
10. KELLER, Edward A. and DeVecchio, Duane E. (2011) Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes. Prentice Hall; 3 Edition, Upper Saddle River, New Jersey, USA.
11. Khan A.N. (2016) Introduction to Hazards and Disasters. Al-Azhar Environmental planning and management, Peshawar
12. KHAN, A. N. (2009) Integrating Disaster Management and Climate Change Adaptation into Policy Making. Proceedings of the International Disaster Management Conference -2009, Baragali – Summer Campus, University of Peshawar, Khyber Pakhtunkhwa, Pakistan.
13. KREBS, Robert E. (2003) The Basics of Earth Science. Greenwood, Westport, Connecticut, USA.
14. Rahman A**.** 2010. Disaster Risk Management: Flood Perspective. VDM Verlag Publishing Co. Ltd Germany, ISBN 978-3-639-29891-8, 192 Pages.
15. Rahman A., Khan AN., Shaw R. (2015) Disaster Risk Reduction

Approaches in Pakistan. Springer Tokyo.
16. SENE, Kevin (2009) Hydrometeorology: Forecasting and Applications. Springer, 1 Edition, Heidelberg, Berlin, Germany.
17. Shaw R, Rahman A, Surjan A, Parvin GA. 2016. Urban Disasters and Resilience in Asia. Elsevier, New York.
18. STRAHLER, A H. and Strahler, A (2004) Physical Geography: Science and Systems of the Human Environment. John Wiley & Sons, 3 Edition, Hoboken, New Jersey, USA