MALAVIYA MISSION TEACHER TRAINING PROGRAMME

CS2 Centre for Science and Society

MMTTC @CS2-IISER BHOPAL IS ORGANISING

One-Week Residential Faculty Development Programme

"Climate Change–Floods and Droughts: Science, Impacts, and AI/ML Approaches"

22-27 SEPTEMBER 2025 | **IISER BHOPAL**

DURATION OF PROGRAMME

The One-Week Residential Faculty Development Programme (FDP) has a duration of 6 working days, equating to a total of 36 hours. Each day comprises 4 sessions, with each session spanning 90 minutes.

ELIGIBILITY CRITERIA

The FDP is open to faculty from State and Central Universities, affiliated and private colleges. The NOC may be submitted at the time of registration or later.

CERTIFICATION CRITERIA

To receive a certificate, participants must submit feedback , complete all assignments test. Fulfillment of these criteria is mandatory.

Limited Seats

FCFS basis

Scan the QR code to know more and to register

Register Now

0755 269 2416 | https://cs2.iiserb.ac.in | mmc@iiserb.ac.in

MALAVIYA MISSION TEACHER TRAINING PROGRAMME | INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH BHOPAL | CS2 Centre for Science and Society

Tentative Schedule

Day 1: Science of Hydrometeorological Extremes

Plenary Lecture 1 by External Speaker (1 Hr)

Lecture (2 hrs)

- Introduction to hydrometeorological extremes: floods and droughts
- Atmospheric and hydrological drivers of extremes (ENSO, monsoon, westerlies)
- Trends in floods and droughts under climate change (India and global perspective)

Hands-on (3 hrs)

- Exploring IMD and ERA5 datasets for temperature and rainfall extremes
- Plotting seasonal and annual time series using Python (e.g., rainfall, Tmax, Tmin)
- Identifying extreme years and spatial visualization using maps

Day 2: Climate Data Sources and Preprocessing

Keynote Lecture by External Speaker (1 Hr)

Lecture (2 hrs)

- Types of hydroclimatic data: station, gridded, satellite, reanalysis, and model outputs
- Data formats (NetCDF, CSV), spatial and temporal resolution issues
- Bias correction and missing data imputation basics

Hands-on (3 hrs)

- Reading and extracting gridded data (NetCDF) using Python (e.g., xarray, netCDF4)
- Time series extraction for point and regional scales
- Handling missing values and visualizing spatio-temporal patterns

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Tentative Schedule

Day 3: Statistical Methods for Extreme Value Analysis

Keynote Lecture by External Speaker (1 Hr)

Lecture (2 hrs)

- Extreme value theory: Block maxima (GEV), Peaks over Threshold (POT)
- Return levels and periods
- Trends and change point analysis (Mann-Kendall, Pettitt)

Hands-on (3 hrs)

- Fitting GEV and POT distributions to rainfall/flood data (SciPy, lmoments3)
- Estimating return levels (e.g., 50-yr, 100-yr rainfall)
- Applying Mann-Kendall and Sen's slope trend tests on temperature and rainfall series

Day 4: Multivariate Analysis of Hydrometeorological Extremes

Keynote Lecture by External Speaker (1 Hr)

Lecture (2 hrs)

- Need for multivariate analysis: joint behaviour of peak, volume, duration
- Introduction to copulas: theory and types (Gaussian, Clayton, Gumbel)
- Concepts of joint return period, Kendall's tau, and tail dependence

Hands-on (3 hrs)

- Fitting bivariate/trivariate copulas for flood characteristics
- Estimating joint probabilities and return periods
- Visualising joint distributions and dependence structures

Tentative Schedule

Day 5: AI/ML for Extreme Event Detection and Prediction

Keynote Lecture by External Speaker (1 Hr)

Lecture (2 hrs)

- Introduction to AI/ML for environmental data: classification and regression
- Algorithms overview: Random Forest, Support Vector Machine, K-Means
- Feature engineering and importance in climate-extreme context

Hands-on (3 hrs)

- Preparing labeled datasets for extreme event classification
- Building a Random Forest classifier to detect extreme rainfall days
- Unsupervised learning (clustering) for drought/flood regime classification

Day 6: Risk Communication, Adaptation, and Policy Implications

Keynote Lecture by External Speaker (1 Hr)

Lecture (2 hrs)

- Frameworks: Sendai, IPCC risk paradigm, NDMA guidelines
- From science to policy: challenges in communicating uncertainty
- Adaptation and mitigation strategies (green infrastructure, early warning systems)

Hands-on (3 hrs)

- Designing a simple decision-support dashboard (e.g., in Streamlit/QGIS)
- Group exercise: Develop a regional risk map and adaptation plan
- Simulating a stakeholder meeting: communicating results to non-technical audience

NO OBJECTION CERTIFICATE

This is to certify that Dr/Mr./Ms. …….. is working as ..... in the Department of …….... ..... University/College/Institute..... ..... w.e.f. ….....…….....

Hereby, he/she is permitted for attending the One Week Residential Faculty Development Programme on ***"Climate Change – Floods and Droughts: Science, Impacts, and AI/ML Approaches"***, being organised by Malviya Mission Teacher Training Centre (MMTTC) - Indian Institute of Science Education and Research Bhopal (IISERB) from **22-27 Sept 2025 at IISER Bhopal.**

Place : ……

Date : …….

Signature

(Head of Institution/Principal/HoD)

(with Seal)