(Form for the Submission of Proposal)

Global e-Learning Program for International Students and Faculties
(IIT-I Global e-Learning Program)
International Relations Office
Indian Institute of Technology Indore

1	Title of the Global e-Learning Program (e.g.: "Machine Learning in Energy Science")	**Comprehensive Water Quality Monitoring: Field Sampling, Lab Insights, and Satellite Data Applications**
2	Proposed dates and duration of the program	March 01 – 09, 2026
3	Name of the Course Coordinator(s) (Name, Designation, Department, email, contact number)	**Dr. Mayur Shirish Jain** Designation: **Assistant Professor** Department: **Civil Engineering** Email: **mayur.jain@iiti.ac.in** Contact: **+91- 731 660 3384** **Dr. Unmesh Khati** **Designation:** Assistant Professor **Department:** Department of Astronomy, Astrophysics and Space Engineering **Email:** unmesh.khati@iiti.ac.in **Contact:** +91- 0731-660-3386
4	Details of the Course Instructor(s) from IIT Indore (Name, Designation, Department, email, contact number)	**Dr. Mayur Shirish Jain** Designation: **Assistant Professor** Department: **Civil Engineering** Email: **mayur.jain@iiti.ac.in** Contact: **+91- 731 660 3384** **Dr. Unmesh Khati** **Designation:** Assistant Professor **Department:** Department of Astronomy, Astrophysics and Space Engineering **Email:** unmesh.khati@iiti.ac.in **Contact:** +91- 0731-660-3386

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5	Names of the Proposed invited experts outside IIT Indore	Not Applicable / No external experts proposed for this program.
6	Details and Modules of the program (Lectures and Tutorials)	**Module 1: Water Quality Fundamentals & Optical Behaviour** Instructor: Dr. Mayur Shirish Jain Duration: **1.5 hours** Mode: **Lecture** **Topics Covered:** • Overview of key water quality parameters: physical, chemical, biological, and emerging contaminants • Field sampling techniques: grab and composite sampling, depth-based sampling, contamination control • Sample preservation and importance of field metadata • Optical properties of water: absorption, scattering, and backscattering processes • Optically active versus optically inactive water quality parameters and their relevance to remote sensing **Module 2: Laboratory Demonstration of Water Quality Analysis** **Instructor: Dr. Mayur Shirish Jain** **Duration:** 1.25 hours **Mode:** Demonstration / Tutorial

		Topics Covered: • Demonstration of turbidity measurement using a turbidity meter • Overview of Total Suspended Solids (TSS) analytical workflow • Chlorophyll-a sample handling and extraction concept • Demonstration of basic physico-chemical measurements (pH, DO, EC) • Secchi disk transparency measurement • Interpretation of representative laboratory results and their significance for satellite-based calibration **Module 3: Remote Sensing Principles for Water Quality Monitoring** Instructor: **Dr. Unmesh Khati** Duration: **1.5 hours** Mode: **Lecture** **Topics Covered:** • Spectral signatures of inland water bodies • Reflectance behaviour of suspended sediments, algae, and CDOM • Satellite platforms for water quality monitoring: Sentinel-2 MSI, Landsat-8/9 OLI, Sentinel-3 OLCI • Atmospheric correction approaches for water applications • Spatial, temporal, and spectral limitations in inland water remote sensing **Module 4: Algorithms for Estimating Water Quality Parameters**

		Instructor: Dr. Unmesh Khati **Duration:** 1.25 hours **Mode:** Lecture / Tutorial **Topics Covered:** • Band-ratio and semi-analytical models for water quality estimation • Algorithms for turbidity, TSS, chlorophyll-a, and CDOM • Calibration and validation using ground and laboratory data • Uncertainty, accuracy assessment, and model limitations **Module 5: Hands-on Training Using Google Earth Engine (GEE)** **Instructor: Dr. Unmesh Khati** **Duration:** 1.25 hours **Mode:** Hands-on Tutorial **Activities:** • Accessing and preprocessing Sentinel-2 and Landsat imagery in GEE • Cloud masking and water body extraction (NDWI, MNDWI) • Computation of indices such as NDTI (turbidity) and FAI (algal blooms) • Implementation of water quality parameter estimation algorithms • Visualization, mapping, and export of results

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		Module 6: Case Studies – Ground to Satellite Integration **Instructor: Dr. Mayur Shirish Jain** **Duration:** 1.25 hours **Mode:** Lecture / Discussion **Topics Covered:** • Integrated case studies from lakes and river systems • Linking field sampling, laboratory observations, and satellite-derived estimates • Challenges in ground-satellite data integration • Applications for environmental monitoring and management **Total Program Duration: 8 Hours**
7	Target groups (UG/PG/Ph.D. Students or Faculties)	**Undergraduate (UG) students** in Civil Engineering, Environmental Engineering, Water Resources, Geography, Earth Sciences, Environmental Sciences, and related disciplines. **Postgraduate (PG) students** specializing in Environmental Engineering, Remote Sensing, GIS, Hydrology, Water Resources, Climate Science, and Sustainability. **Ph.D. scholars** working in water quality monitoring, environmental assessment, remote sensing, geospatial analysis, or related research areas. **Faculty members and early-career researchers** from universities and research institutions are interested in integrating field-based water quality assessment with satellite and geospatial techniques.

		Working professionals from water utilities, environmental consultancies, government agencies, NGOs, and international organizations are involved in monitoring and managing water quality.
8	Pre-Requisites and Minimum Education Qualification (if any)	**Minimum Qualification:** Undergraduate students in their **second year or above**, postgraduate students, Ph.D. scholars, faculty members, or working professionals from engineering, science, or allied disciplines. **Academic Background (Preferred):** Civil Engineering, Environmental Engineering, Water Resources, Hydrology, Geography, Earth Sciences, Environmental Sciences, Remote Sensing, GIS, or related fields.
6	How will this program benefit the participants? (in bullet points)	a) Gain a comprehensive understanding of water quality monitoring, covering field sampling concepts, laboratory interpretation, and satellite-based assessment in an integrated framework. b) Learn how ground and laboratory water quality data are generated and used for calibration and validation of remote sensing-based water quality estimates. c) Develop practical knowledge of optically active and optically inactive water quality parameters and understand which parameters can be reliably monitored using satellite data. d) Acquire hands-on experience with Google Earth Engine (GEE) for accessing, processing, and visualizing satellite imagery for water quality applications. e) Understand remote sensing algorithms for estimating turbidity, TSS, chlorophyll-a, CDOM, and algal bloom indicators in inland water bodies. f) Enhance skills in integrating field observations, laboratory insights, and satellite analytics for real-

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		world water quality monitoring and research applications. g) Gain exposure to real case studies from Indian and global water bodies, improving the ability to apply learned concepts to diverse environmental contexts. h) Build interdisciplinary competence at the interface of environmental engineering, geospatial analysis, and earth observation, improving academic and professional prospects. i) Strengthen readiness for research projects, higher studies, and professional roles related to water quality assessment, environmental monitoring, and remote sensing-based decision support.
Submitted by Dr. Mayur Shirish Jain & Dr. Unmesh Khati (Signature and Date) Course Coordinator(s)		**Approval and Remarks** (Signature and Date) Dean, International Relations, IIT Indore