DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
INSTITUTE OF TECHNOLOGY
University of Kashmir
NAAC Accredited Grade 'A++'

DEPARTMENTAL REPORT

Technical Tour to Upper Sindh Hydroelectric Project–II (USHP-II), Kangan

B.Tech 3rd Semester and M.Tech 3rd Semester Students

Date of Tour	Thursday, 5 November 2026
Destination	Upper Sindh Hydroelectric Project–II (USHP-II) Power House, Kangan (Jammu & Kashmir Power Development Corporation – JKPDC)
Participants	B.Tech 3rd Semester and M.Tech 3rd Semester students of the Department of Electronics and Communication Engineering
Reporting Point	Front lawns of Block C, Institute of Technology, Zakura Campus – 10:00 a.m.
Tour Coordinator	Er. Rouf ul Alam, Coordinator, Department of ECE
Nature of Visit	One-day industrial / educational visit

Submitted by: Department of Electronics and Communication Engineering

Report date: 9 November 2026

1. Introduction

Industrial exposure complements classroom teaching by allowing students to see how the principles of electrical power, control and communication are applied in real installations. With this objective, the Department of Electronics and Communication Engineering, Institute of Technology, University of Kashmir, organised a one-day technical tour for the B.Tech 3rd Semester and M.Tech 3rd Semester students to the Upper Sindh Hydroelectric Project–II (USHP-II) power house at Kangan on Thursday, 5 November 2026.

The visit gave students first-hand exposure to the working of a hydroelectric generating station, from the generation of electricity to its distribution through the switchyard.

2. Objectives of the Tour

- To give students practical exposure to the working of a hydroelectric power station.
- To help students understand the process of power generation, distribution and switchyard arrangement.
- To relate classroom concepts of electrical machines, power systems, instrumentation, control and communication to an operating industrial plant.
- To familiarise students with the safety practices, discipline and working environment of a power utility.
- To interact with plant engineers and faculty and encourage curiosity about careers in the power and allied sectors.

3. Permission and Pre-Tour Arrangements

The Office of the Chief Engineer, Generation Wing Kashmir, JKPDC, Bemina, Srinagar, communicated permission for the visit to the Executive Engineer, GD USHP-II Kangan, vide letter No. CEG/PDC/Tech/5938-40 dated 04-11-2026 (Annexure B-1). The permission was granted subject to the following conditions:

- Adherence to all rules, regulations and safety measures was the responsibility of the institution and students, and no one was to interfere with the machinery of the power house.
- The students were to undertake the tour at the risk and responsibility of the institution.
- No claim for stipend or remuneration was to be made by the students or the institution.
- Valid identity credentials issued by the institution were to be produced for verification, and large groups could be taken in smaller batches for safety.

The Department issued a notice dated 04-11-2026 (Annexure B-2) informing all eligible students of the schedule, the accompanying faculty, and the following instructions: report punctually at the assembly point; carry valid identity cards; follow the safety instructions of the faculty and power-house staff; stay with the assigned groups; and refrain from touching any machinery, equipment or controls.

4. Participants

4.1 Students

A total of **42 students of B.Tech 3rd Semester** attended the tour along with the M.Tech 3rd Semester students of the Department. The names of the B.Tech students are given in Annexure A.

4.2 Accompanying Faculty

S. No.	Name	Role
1	Er. Rouf ul Alam	Coordinator, Department of ECE
2	Dr. Abdul Mueed Hafiz	Escort Faculty
3	Dr. Ifat Rasheed	Escort Faculty
4	Dr. Injila Mubarik	Escort Faculty
5	Er. Yawar Hayat	Escort Faculty
6	Dr. Irfan Faiq	Escort Faculty

5. Proceedings of the Visit

The students assembled at the front lawns of Block C, Zakura Campus, at 10:00 a.m. on 5 November 2026 and, after attendance and identity verification, travelled to the USHP-II power house at Kangan under the supervision of the escort faculty. On arrival, the students were taken through the plant in groups and, following the safety instructions of the power-house staff, observed the plant in the natural order of energy flow, starting from the generating units and ending at the switchyard.

The faculty explained, in sequence, the **generation** of electrical power, the **distribution** of the generated power, and the **switchyard** detailing of the power plant. Students observed the equipment, listened to the explanations and clarified their doubts with the faculty and plant personnel. A group photograph was taken at the end of the visit.



Fig. 1: Group photograph of the students and accompanying faculty during the technical tour

6. About the Power Station

Upper Sindh Hydroelectric Project–II (USHP-II) is a run-of-river hydroelectric power station located at Kangan in Ganderbal district of Jammu and Kashmir, on the Sindh (Sind) river system. It is owned and operated by the Jammu and Kashmir Power Development Corporation (JKPDC). The station has three generating units of 35 MW each, giving a total installed capacity of 105 MW, and is one of the principal state-owned generating stations in the Kashmir valley.

Owner / Operator	Jammu and Kashmir Power Development Corporation (JKPDC)
Location	Kangan, Ganderbal district, Jammu and Kashmir
Type of scheme	Run-of-river hydroelectric power station
Generating units	Three units (Unit-1, Unit-2 and Unit-3), 35 MW each
Installed capacity	3 x 35 MW = 105 MW
Turbine type	Francis turbines
Evacuation voltage	132 kV (as marked on the line relay and metering panel: 132 kV Sumbal–Kangan circuit)

Note: Installed capacity, ownership and location are as published by JKPDC and other public sources; the 132 kV evacuation voltage and unit arrangement were observed in the plant.

7. Detailing of the Plant: From Generation to Switchyard

The path taken by the energy at USHP-II can be summarised as follows, and each stage is described in the sub-sections after the figure.

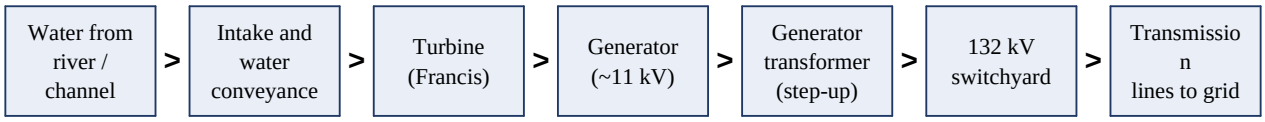


Fig. 2: Flow of energy in a run-of-river hydroelectric station such as USHP-II

7.1 Water Conveyance and Power House

In a run-of-river station, water diverted from the river is led through the intake and conveyance system to the power house, where it is made available to the turbines under the head of the scheme. After doing its work in the turbine, the water is released through the draft tube into the tail water and returned to the river without any consumptive loss. The power house building seen during the visit has a gantry crane on its deck, used for handling heavy equipment during installation and maintenance, and the outdoor transformers are located alongside the building next to the water body.



Fig. 3: Power house structure with gantry crane and outdoor transformer bay alongside the water body

7.2 Turbine and Generator Units

The station has three identical generating units, each rated at 35 MW. Each unit consists of a Francis turbine, a medium-head reaction turbine in which water enters through a spiral casing, passes through guide vanes (wicket gates) and flows radially inward over the runner, transferring its energy to the shaft. The turbine is directly coupled to a synchronous generator, which converts the mechanical energy of the rotating shaft into three-phase alternating electricity at 50 Hz. The SCADA display in the control room indicated a generator-terminal voltage of about 10.9 kV for the unit being monitored and a system frequency of about 50 Hz.

The main auxiliary systems of each unit, as explained during the visit and as seen on the control displays, are:

- **Governing system** – the guide vane (gate) opening is controlled to regulate the water flow and hence the power output and speed of the unit.
- **Excitation system** – supplies the generator field so that the terminal voltage and reactive power can be controlled.
- **Lubrication and cooling systems** – oil and water circuits for the bearings and the generator, with trip alarms for abnormal oil pressure or level.
- **Start and stop sequences** – automatic start/stop sequence with indication of sequence failure, speed, breaker status and emergency trips.

7.3 Control Room and SCADA

All three units and the outgoing feeders are monitored and operated from the control room. The control desk has computer-based supervisory control and data acquisition (SCADA) screens. One screen shows the single-line diagram of the station, with unit-wise operation pages for Unit-1, Unit-2 and Unit-3, the status of breakers and isolators, and the loading of the outgoing lines. The second screen shows a unit-level page with multifunction meter readings (line and phase voltages, phase currents, power factor, active power in MW, reactive power in MVAR, apparent power in MVA and frequency), together with excitation, governor and trip status. At the time of the visit one unit was seen delivering about 8.4 MW. The operator also maintains the hourly log sheets by hand, which are kept on the desk.

This is the part of the plant most directly connected to Electronics and Communication Engineering: sensors and transducers feed measured values to programmable controllers and relays, which pass them over communication links to the SCADA computers for display and control.

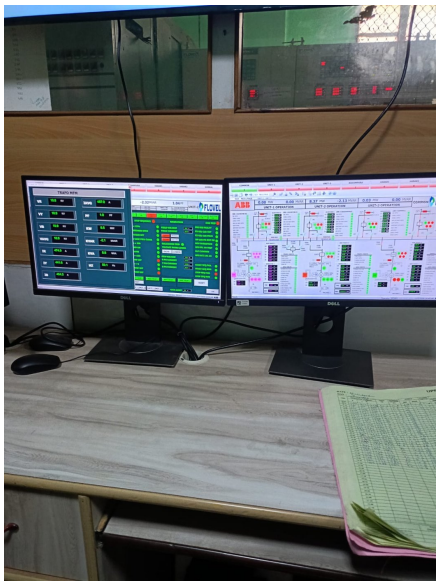


Fig. 4: Control room SCADA screens showing the station single-line diagram and unit measurement/excitation page

7.4 Generator, Transformer and Line Relay and Metering Panels

Beside the control desk are the relay and metering panels, one set for each generating unit and one for each outgoing line. The panels seen during the visit included the **Unit-3 Generator-cum-Transformer Relay and Metering Panels (A and B)**, the **Control Relay Panel of Generator-3** and the **Line Relay and Metering Panel** for the **132 kV Sumbal–Kangan circuit**. These panels carry:

- **Numerical (microprocessor-based) protection relays** that continuously monitor current and voltage and detect faults such as over-current, earth faults and differential faults in the generator, transformer and line.
- **Digital multifunction meters** that display voltage, current, power and frequency.
- **Annunciation windows** (alarm and trip indication lamps) that show the exact protection or equipment alarm that has operated.
- **Control switches, indicating lamps and emergency push-buttons** for local control of the breaker and for emergency tripping.
- **Mimic diagram** printed on the panel, showing the generator, transformer, breaker and busbar arrangement in line-diagram form, along with test blocks and trip-circuit supervision relays.



Fig. 5: Unit-3 Generator-cum-Transformer relay and metering panels and the 132 kV Sumbal–Kangan line relay and metering panel

7.5 Step-up Transformation and Distribution of Power

The generators produce power at around 11 kV, which is too low for efficient transmission over long distances. Each generator is therefore connected to a step-up (generator) transformer, which raises the voltage to the 132 kV level of the switchyard. At higher voltage the same power is carried at lower current, which reduces the I^2R losses and the size of the conductors required. The faculty explained how the power flows from the generator through its circuit breaker to the transformer and then to the 132 kV busbar of the switchyard, from where it is distributed to the outgoing lines. The SCADA single-line diagram showed the outgoing feeders by name, including those to **Badampura, Habak (Habak-1 and Habak-2) and Sumbal**, and the relay panels showed the 132 kV Sumbal–Kangan circuit.

7.6 Switchyard

The switchyard is the open-air section of the station where the generator transformers are connected to the busbars and the outgoing transmission lines. It was the final stage of the visit, where the faculty explained the layout and purpose of each type of equipment. The principal equipment observed and discussed is listed below.

Equipment	Function
Generator / power transformers	Step the generation voltage up to the 132 kV transmission level; they are fitted with bushings, tap changer, cooling and protective devices such as the Buchholz relay and temperature indicators.
Circuit breakers	Switch circuits on and off under normal load and interrupt very large fault currents automatically when commanded by the protection relays.
Isolators (disconnecting switches)	Provide a visible air gap to isolate a de-energised part of the yard for safe maintenance; they are operated only when no current is flowing.
Busbars	Common conductors to which incoming and outgoing circuits are connected, so that power can be shared and rerouted.
Current transformers (CTs) and potential/voltage transformers (PTs/CVTs)	Reduce the very high current and voltage to small, safe values (for example, 1 A or 5 A and 110 V) for the relays and meters in the control room.
Lightning arresters and earth wire	Protect the equipment from lightning and switching surges by diverting the surge safely to earth.
Wave trap and line equipment	Allow communication signals to be carried over the power lines without disturbing the power flow, where power line carrier communication is used.
Insulators, steel support structures and earthing grid	Support the live conductors at the required clearances and provide a safe path for fault current to earth.

Large porcelain-insulated outdoor equipment mounted on lattice steel support structures was seen in rows in the switchyard (Fig. 6), with the overhead conductors strung between the gantry structures. Outside the yard, the outgoing 132 kV transmission towers carry the generated power to the grid (Fig. 7).



Fig. 6: Students being briefed by the faculty in the switchyard, with high-voltage equipment on steel support structures



Fig. 7: Switchyard gantries and outgoing transmission towers as seen from the plant approach road

8. Relevance to Electronics and Communication Engineering

Modern power stations depend heavily on electronics and communication technologies. The visit helped students appreciate how subjects studied in the programme connect with a power utility, for example:

- **Sensors, transducers and instrumentation** used for measuring voltage, current, temperature, pressure and level.
- **Numerical relays and digital control systems** built on microprocessors, which form the basis of generator, transformer and line protection.
- **SCADA and telemetry**: acquisition of plant parameters, display on operator screens and remote supervision, as seen on the control room screens.
- **Communication links** between the power house, switchyard and grid control centres, including power line carrier communication through wave traps.
- **Power electronics and signal conditioning** relevant to excitation, metering and control.

9. Learning Outcomes and Observations

- Students gained a clear picture of the complete path of electrical energy in a hydroelectric station, from the generating unit to the switchyard.

- Theoretical topics such as transformers, synchronous machines, protection and power transmission were seen in real operating equipment.
- Students saw a real SCADA system and numerical relay panels in operation and understood the role of electronics and communication in plant control and protection.
- Students observed the importance of discipline, teamwork and strict safety protocols in a high-voltage environment.
- The visit gave students a better understanding of the scope of work and career opportunities in the power sector.
- The tour was conducted in an orderly manner and all participants followed the instructions given by the faculty and the power-house staff.

10. Conclusion

The technical tour to USHP-II, Kangan, was a useful and well-organised academic exercise. It bridged the gap between theoretical knowledge and industrial practice and gave the B.Tech and M.Tech 3rd Semester students valuable exposure to the generation, distribution and switchyard aspects of a hydroelectric power plant, as well as to its control, protection and monitoring systems. The Department recommends that such industrial visits continue to be organised regularly as part of the learning process.

11. Acknowledgements

The Department of Electronics and Communication Engineering expresses its sincere gratitude to the Office of the Chief Engineer, Generation Wing Kashmir, JKPDC, the Executive Engineer, GD USHP-II Kangan, and the engineers and staff of the power house for granting permission and for their cooperation and guidance during the visit. The Department also thanks the Director of the Institute of Technology for support and the escort faculty members for ensuring the smooth conduct of the tour.

Er. Rouf ul Alam
Coordinator
Department of Electronics and Communication Engineering
Institute of Technology, University of Kashmir

Annexure A

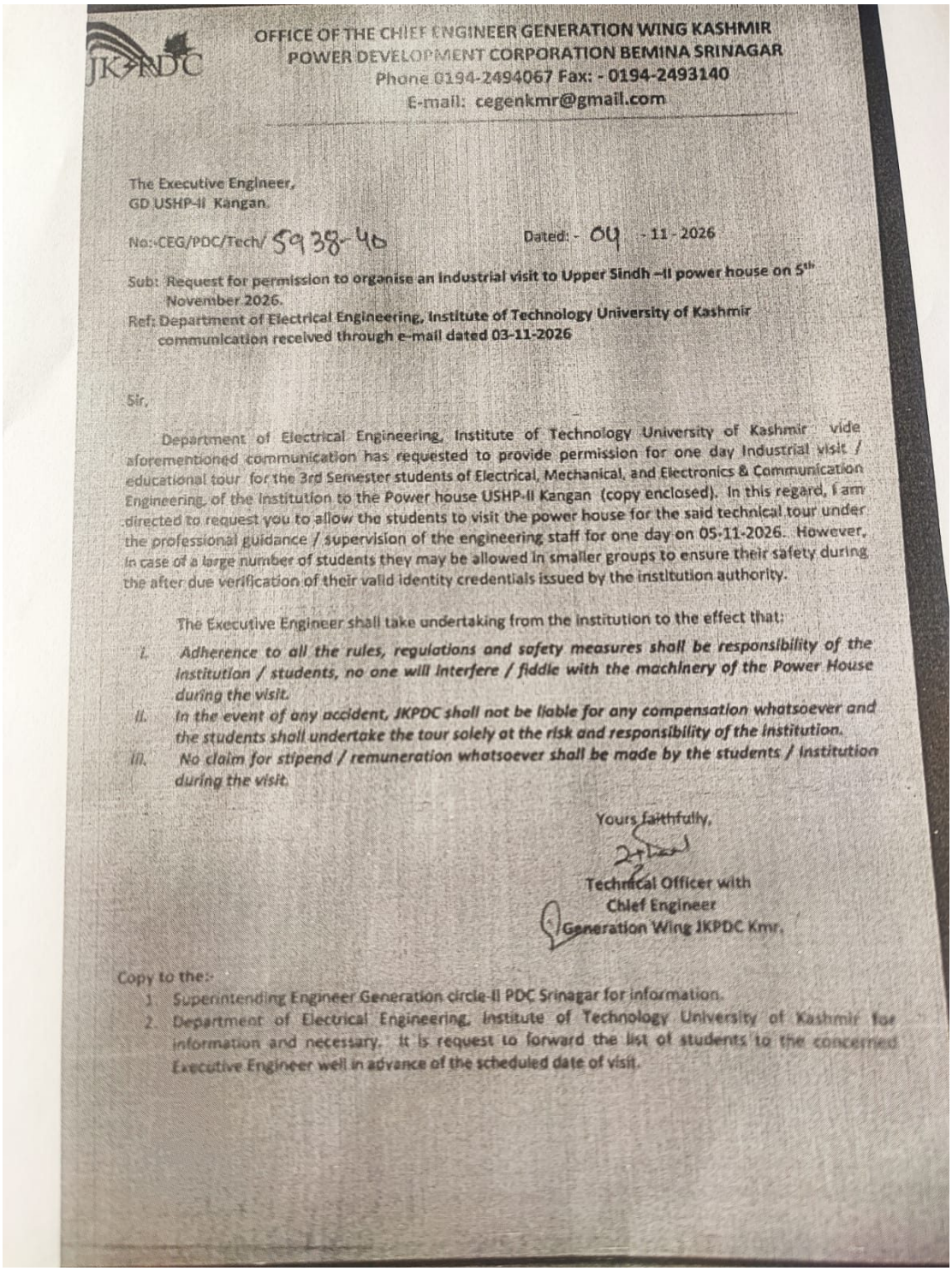
List of B.Tech 3rd Semester Students Who Attended the Tour

S. No.	Name of Student	S. No.	Name of Student
1	Behzad	22	Salman
2	Farhaan	23	Mutiba
3	Qasim	24	Aliza
4	Ibraheem	25	Wasiq
5	Numair	26	Shaida
6	Kaleem	27	Pz Farhan
7	Aweed	28	Tawheed
8	Moazam	29	Dayam
9	Aazim	30	Faheem
10	Humaid	31	Adnan
11	Zahid	32	Suwaid
12	Bahzeel	33	Ahsan Ali
13	Faisal	34	Sarhaan
14	Rasim	35	Fatima
15	Khushnuma	36	Mujadid
16	Maahim	37	Aamina
17	Sehrish	38	Sadaf
18	Tamana	39	Wahaaj
19	Aleena	40	Manaan
20	Rutba	41	Salif
21	Ebreen	42	Adawi

Total number of B.Tech students: 42

Annexure B-1

Permission letter issued by the Office of the Chief Engineer, Generation Wing Kashmir, JKPDC, vide No. CEG/PDC/Tech/5938-40 dated 04-11-2026



OFFICE OF THE CHIEF ENGINEER GENERATION WING KASHMIR
POWER DEVELOPMENT CORPORATION BEMINA SRINAGAR
Phone 0194-2494067 Fax: - 0194-2493140
E-mail: cegenkmr@gmail.com

The Executive Engineer,
GD USHP-II Kangan.

No:-CEG/PDC/Tech/ 5938-40 Dated: - 04 - 11 - 2026

Sub: Request for permission to organise an Industrial visit to Upper Sindh –II power house on 5th November 2026.

Ref: Department of Electrical Engineering, Institute of Technology University of Kashmir communication received through e-mail dated 03-11-2026

Sir,

Department of Electrical Engineering, Institute of Technology University of Kashmir vide aforementioned communication has requested to provide permission for one day Industrial visit / educational tour for the 3rd Semester students of Electrical, Mechanical, and Electronics & Communication Engineering of the Institution to the Power house USHP-II Kangan (copy enclosed). In this regard, I am directed to request you to allow the students to visit the power house for the said technical tour under the professional guidance / supervision of the engineering staff for one day on 05-11-2026. However, in case of a large number of students they may be allowed in smaller groups to ensure their safety during the after due verification of their valid identity credentials issued by the institution authority.

The Executive Engineer shall take undertaking from the institution to the effect that:

i. *Adherence to all the rules, regulations and safety measures shall be responsibility of the institution / students, no one will interfere / fiddle with the machinery of the Power House during the visit.*
ii. *In the event of any accident, JKPDC shall not be liable for any compensation whatsoever and the students shall undertake the tour solely at the risk and responsibility of the institution.*
iii. *No claim for stipend / remuneration whatsoever shall be made by the students / institution during the visit.*

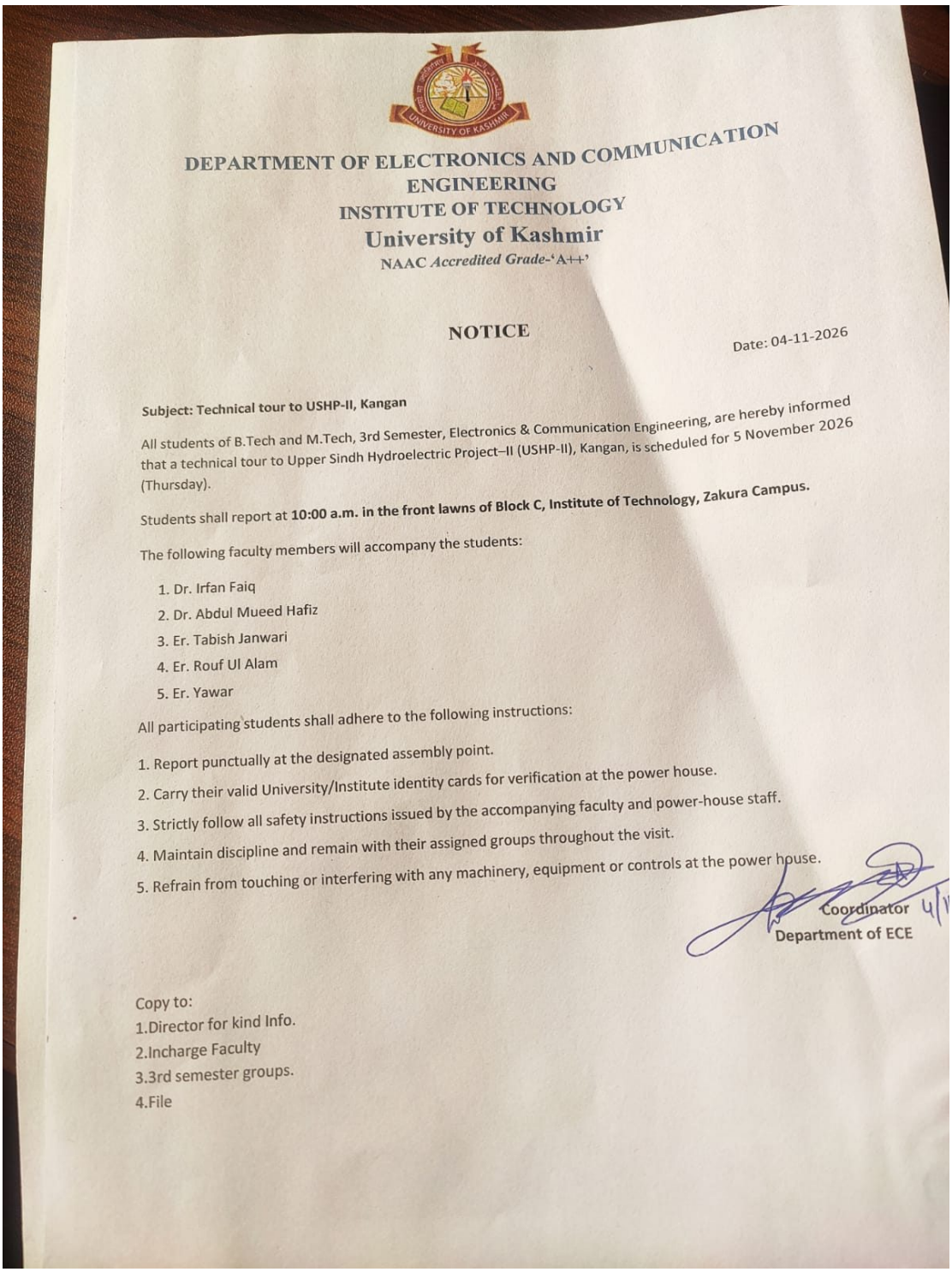
Yours faithfully,

Technical Officer with
Chief Engineer
Generation Wing JKPDC Kmr.

Copy to the:-
1. Superintending Engineer Generation circle-II PDC Srinagar for information.
2. Department of Electrical Engineering, Institute of Technology University of Kashmir for information and necessary. It is request to forward the list of students to the concerned Executive Engineer well in advance of the scheduled date of visit.

Annexure B-2

Departmental notice dated 04-11-2026 regarding the technical tour to USHP-II, Kangan



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
INSTITUTE OF TECHNOLOGY
University of Kashmir
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NOTICE

Date: 04-11-2026

Subject: Technical tour to USHP-II, Kangan

All students of B.Tech and M.Tech, 3rd Semester, Electronics & Communication Engineering, are hereby informed that a technical tour to Upper Sindh Hydroelectric Project–II (USHP-II), Kangan, is scheduled for 5 November 2026 (Thursday).

Students shall report at **10:00 a.m. in the front lawns of Block C, Institute of Technology, Zakura Campus.**

The following faculty members will accompany the students:

1. Dr. Irfan Faiq
2. Dr. Abdul Mueed Hafiz
3. Er. Tabish Janwari
4. Er. Rouf Ul Alam
5. Er. Yawar

All participating students shall adhere to the following instructions:

1. Report punctually at the designated assembly point.
2. Carry their valid University/Institute identity cards for verification at the power house.
3. Strictly follow all safety instructions issued by the accompanying faculty and power-house staff.
4. Maintain discipline and remain with their assigned groups throughout the visit.
5. Refrain from touching or interfering with any machinery, equipment or controls at the power house.

Coordinator
Department of ECE

Copy to:
1.Director for kind Info.
2.Incharge Faculty
3.3rd semester groups.
4.File