

Industrial Visit Report

on

Bhatghar Hydro Electric Power Station, Bhor, Dist. Pune

Date: 30 September 2026



TY Electrical Student & Teacher with Bhatghar Hydro Electric Power Station staff

Industrial Visit Report: Bhatghar Hydro Electric Power Station, Bhore

Date of Visit: 30th September 2026

Organized By: Department of Electrical Engineering, VPKBIET, Baramati

Location: Bhatghar Hydro Electric Power Station, Bhore Dist. Pune

Co-ordinator: Mr. Dipak S. Yeole, Dr. P. N. Jaiswal

1. Introduction:

As part of the Third Year curriculum for Power System Analysis (PSA) and Electrical Machine II (EM II), an industrial visit was organized by the Department of Electrical Engineering, VPKBIET, Baramati, to Bhatghar Hydro Electric Power Station, Bhore, on 30th September 2026. A total 61 students of Third Year (TY) Electrical Engineering along with 03 faculty/staff members, namely Mr. Dipak S. Yeole, Dr. Pooja N. Jaiswal, and Mr. Santosh Magar, visited Bhatghar Hydro Electric Power Station, Bhore.

The main purpose of the visit was to provide students with practical exposure to the operation of a hydroelectric power station and to relate the theoretical concepts studied in PSA and EM II with actual power-system equipment and plant operations.

The visit enabled students to understand the overall process of hydroelectric power generation, the construction and working of synchronous generators, and the role of protection systems in identifying and isolating electrical faults. The interaction with plant engineers and technical staff helped students understand how theoretical concepts are applied in actual power-generation systems.

2. Objectives of the Visit:

The major objectives of the industrial visit were:

- To understand the overall working of a hydroelectric power station.
- To study the construction and working of synchronous generators used in hydroelectric power plants.
- To identify the major electrical and mechanical components of a generating station.
- To relate the practical operation of the plant with concepts studied in Electrical Machine II.
- To understand different types of faults in power systems and their possible effects on generating equipment.
- To observe the protection and control arrangements used for safe and reliable operation.

To understand the importance of maintenance, testing, and monitoring of electrical machines and power-system equipment.

3. Major Observations Related to Power System Analysis (PSA)

During the visit, students were introduced to various aspects of power-system operation and protection. The discussions were particularly related to the **types of faults** studied in the PSA course.

a) Types of Faults

The plant engineers explained that faults in a power system can occur due to insulation failure, equipment malfunction, lightning, conductor damage, or other abnormal operating conditions.

The following major types of faults were discussed:

- **Single Line-to-Ground (L-G) Fault:** A fault involving one phase and ground.
- **Line-to-Line (L-L) Fault:** A fault occurring between two phase conductors.
- **Double Line-to-Ground (L-L-G) Fault:** A fault involving two phases and ground.
- **Three-Phase (L-L-L) Fault:** A balanced fault involving all three phases.
- **Three-Phase-to-Ground (L-L-L-G) Fault:** A three-phase fault involving ground.

Students learned that the magnitude of fault current and its effect on the generating system depend on the type and location of the fault and the electrical parameters of the system.

b) Protection of Generating Equipment

The importance of protection systems in maintaining the safe operation of the generating station was explained. Students learned that protective relays and circuit breakers are used to detect abnormal conditions and disconnect the faulty section from the healthy portion of the system.

The discussion helped students relate classroom concepts such as fault detection, fault current, relay operation, and isolation of faulty sections with their practical implementation in a generating station.

c) Importance of Fault Analysis

Students understood that fault analysis is essential for determining the severity of abnormal conditions and for selecting appropriate protection equipment. The visit provided practical context to the theoretical analysis of symmetrical and unsymmetrical faults studied in PSA.

4. Major Observations Related to Electrical Machine II (EM II)

A major focus of the visit was understanding the construction and working of the synchronous generator used for hydroelectric power generation.

a) Construction of Synchronous Generator

The plant engineers explained the major components of the synchronous generator and their functions. The students were introduced to:

- Stator
- Rotor
- Stator winding
- Rotor field winding
- Shaft
- Bearings
- Cooling arrangement
- Excitation system
- Terminal arrangement

Students observed how the mechanical structure of the generator is designed to withstand continuous operation and how different components are integrated to obtain reliable electrical power generation.

b) Working Principle of Generator

The working principle of the synchronous generator was explained based on Faraday's law of electromagnetic induction.

In a hydroelectric generating station, water energy is converted into mechanical energy by the turbine. The turbine rotates the generator rotor through the shaft. The rotating magnetic field associated with the rotor cuts the stator conductors and induces an electromotive force (EMF) in the stator windings.

Thus, the energy conversion can be represented as:

Hydraulic Energy → Mechanical Energy → Electrical Energy

Students were able to relate this practical energy-conversion process with the theoretical concepts studied in Electrical Machine II.

c) Excitation and Voltage Control

The role of the excitation system in establishing the magnetic field of the synchronous generator was discussed. Students learned that controlling excitation is important for maintaining the required generator terminal voltage and reactive-power characteristics.

d) Generator Monitoring and Maintenance

The engineers also explained the importance of monitoring parameters such as temperature, vibration, insulation condition, bearing condition, and other operating parameters for reliable generator operation.

5. Learning Outcomes

The industrial visit provided students with valuable practical exposure and helped them achieve the following learning outcomes:

- Students understood the working of a hydroelectric power station and the process of electrical power generation.
- Students gained practical knowledge of the construction and working of synchronous generators.
- Students were able to relate the energy-conversion process of a hydroelectric generating unit with concepts studied in Electrical Machine II.
- Students developed a better understanding of L-G, L-L, L-L-G, and three-phase faults discussed in Power System Analysis.
- Students understood the importance of protective devices, relays, and circuit breakers in protecting generating equipment.
- Students gained awareness of the practical importance of fault analysis for safe and reliable power-system operation.
- Interaction with plant engineers helped students understand the importance of regular inspection, testing, maintenance, and monitoring of electrical equipment.
- The visit enhanced students' understanding of the practical applications of concepts studied in the classroom.

6. Conclusion

The industrial visit to Bhatghar Hydro Electric Power Station, Bhore, was an informative and valuable learning experience for the students of Power System Analysis and Electrical Machine II. The visit provided an opportunity to observe the practical aspects of hydroelectric power generation and understand the operation of electrical equipment used in a generating station.

The students particularly benefited from the practical discussion on different types of power-system faults and their protection, which complemented the concepts covered in Power System Analysis. Similarly, observing the generating unit and learning about its construction, working principle, excitation system, and maintenance helped students strengthen their understanding of synchronous generators studied in Electrical Machine II.

Overall, the visit effectively bridged the gap between theoretical classroom learning and practical industrial applications, thereby enhancing the students' technical knowledge and understanding of power-generation systems.



Felicitations of Bhatghar Hydro Electric Power Station staff