



**NATIONAL UNIVERSITY OF ENGINEERING**  
**COLLEGE OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**ELECTRICAL ENGINEERING PROGRAM**

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**EE315 – POWER PLANTS I**

**I. GENERAL INFORMATION**

<b>CODE</b>	: EE315 – Power Plant I
<b>SEMESTER</b>	: 9
<b>CREDITS</b>	: 04
<b>HOURS PER WEEK</b>	: 05 (Theory – Practice)
<b>PREREQUISITES</b>	: EE354 – Analysis of Power Systems II EM121 – Thermal Machines EM221 – Turbomachines EE214 – Electrical Machines II
<b>CONDITION</b>	: Mandatory

**II. COURSE DESCRIPTION**

It is a subject of a theoretical – practical nature and belongs to the area of professional training. Its purpose is to train the student in the theoretical and practical foundations of power plants, so that they know the operation and design criteria of the components of a plant.

**III. COURSE OUTCOMES**

At the end of the course the student will:

- Identify, design and understand the functions of all the components of a power plant.
- Know the concepts necessary to calculate the parameters of the energy processes that happen in the power plant.
- Formulate a maintenance and protection plan for the safety of the plant and its workers.

**IV. LEARNING UNITS**

**1. HYDRAULIC MACHINES AND COMBUSTION MACHINES.**

Principle of energy conversion and prime engines. Components of a hydraulic power plant. Components of a thermal power plant. Hydraulic machines, hydraulic turbines. Gas turbines, steam turbines, diesel engines. Centrals in operation in the Peruvian system.

**2. ALTERNATORS AND CONTROL SYSTEMS.**

Description of the alternator elements. Manufacturing tests, reception, preventive and corrective interventions in the alternators. Statistics of failures in generation systems. Excitation and speed control systems. Alternator operation, normal and emergency cases.

**3. PROTECTION, AUXILIARY SERVICES, SECURITY IN CENTRALS.**

Monitoring, measurement and protection equipment in plants. Key yards, grounding system, emergency groups. Maneuvering equipment, measuring boards and controls. Mechanical

systems: pumps, wells, filter chambers or tanks, pressure switches, thermostats, air conditioning, compressed air, crane bridge and periscope. Communication systems: radio, carrier wave, microwave and others.

#### **4. OPERATION, SECURITY AND MAINTENANCE OF POWER STATIONS.**

Central operation: start and stop of groups, automatic and manual synchronization, connection and disconnection of lines in the system and change of bus configuration. Security measures: special repair work in groups, transformers, cells and lines. Periodic inspections of tunnels, mechanical and electrical equipment. Stock of spare parts and economic criteria for component replacement. Preventive and corrective maintenance, Repairs.

### **V. METHODOLOGY**

The course is developed in theory and practice sessions. In the theory sessions the teacher presents the concepts, principles for power plant design and their applications in a real design project. In the practical sessions different problems and their various applications are presented and solved. In all classes the active participation of the student is promoted both in the analysis and in the solution of problems.

### **VI. EVALUATION FORMULA**

The learning will be evaluated through the "F" system.

- Partial Exam (PE): Weight 1
- Final Exam (FE): Weight 2
- Average of Practices (P): Weight 1.

$$FA = \frac{PE + 2 * FE + P}{4}$$

### **VII. BIBLIOGRAPHY**

- "Electricity Power Generation", Digambar M. Tagare. John Wiley & Sons, 2011.
- "Hydroelectric Power", Josepha Sherman. Capstone, 2004.
- "Power Plant Engineering", Manoj Kumar Gupta. PHI Learning, 2012.