



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

**ELECTRICAL ENGINEERING PROGRAM**

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**EE241 – LABORATORY OF ELECTRICAL MACHINES I**

**I. GENERAL INFORMATION**

<b>CODE</b>	: EE241 – Laboratory of Electrical Machines I
<b>SEMESTER</b>	: 7
<b>CREDITS</b>	: 01
<b>HOURS PER WEEK</b>	: 03 (Laboratory)
<b>PREREQUISITES</b>	: EE211 Electrical Machines I
<b>CONDITION</b>	: Mandatory

**II. COURSE DESCRIPTION**

The course includes the operation and / or operation of electric machines, initially with the iron core reactor and the single-phase transformer; which was studied theoretically in the course of Electrical Machines I, in the VI cycle. The student will know the principle and / or operation of an electric machine, using the measuring instruments properly and will also compare the experimental results with the theoretical ones given on the data plate, all this in the framework of integration with their groupmates, the which will be useful in their future professional life.

**III. COURSE OUTCOMES**

At the end of the course the student will:

- Check by means of experimental tests on a static and / or rotating machine, the laws of electromagnetism of a magnetic circuit.
- Properly handle measuring and visualization equipment and instruments, connecting them correctly.
- Organize the results in order and graph using office software that show the relationships and dependencies between the variables.
- Correctly interpret the results obtained and formulate conclusions.
- Compare the experimental results with the theoretical ones, verifying the validity of laws.
- Integrate to work groups and actively participates in a team
- Present a final report organized and well-structured for each experience with its own conclusions.
- Use computer tools for data processing
- Make references to the bibliographic sources consulted.

#### IV. LEARNING UNITS

##### 1. THE IRON CORE REACTOR

Obtaining characteristic B - H. Separation of losses. Observation of the Hysteresis Loop and Waveform of the Reactor Current.

##### 2. THE SINGLE-PHASE TRANSFORMER

Obtaining Resistance in DC. Vacuum test. Short circuit test. Load test.

##### 3. TRAINING OF MAGNETIC FIELDS IN ROTATING MACHINES

Formation of a Stationary Field with DC. Rotating Magnetic Field Production.

##### 4. PARALLEL OF SINGLE-PHASE TRANSFORMERS.

Vacuum excitation characteristics. Trial with load. External feature Regulation feature

##### 5. THE ASYNCHRONOUS MACHINE

Free rotor test (vacuum). Locked rotor test. Test as a motor under load.

#### V. LABORATORIES AND PRACTICAL EXPERIENCES

- The Iron Core Reactor
- The single-phase transformer
- Formation of magnetic fields in rotary machines
- Parallel Single-Phase Transformers
- Single phase transformers in three phase connection.

#### VI. METHODOLOGY

In these 5 laboratory sessions, the student participates with his team or work group, within an appropriate space that is the electricity laboratory, will perform the operation and / or operation of the electric machine and observe its behavior by reading the Measuring instruments, which will be properly calibrated with both the guidance of the teacher in charge of the course and the laboratory staff.

#### VII. EVALUATION FORMULA

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

- Four laboratory experiences with the highest grades (P).
- Final Control Exam (C)

$$FA = \frac{P1 + P2 + P3 + P4 + C}{5}$$

#### VIII. BIBLIOGRAPHY

- KOSTENKO - PIOTROSKY, Volume II. Electric machines.
- IVANOV - SMOLENSK, Volume II. Electric machines.
- LANGSDORF. Alternating Current Machine Theory