# NATIONAL UNIVERSITY OF ENGINEERING
## COLLEGE OF MECHANICAL ENGINEERING
## MECHANICAL-ELECTRICAL ENGINEERING PROGRAM

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# ML223 – LABORATORY OF STATIC ELECTRICAL MACHINES

## I. GENERAL INFORMATION

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| CODE | : ML 223 Laboratory of Static Electrical Machines |
| SEMESTER | : 7 |
| CREDITS | : 1 |
| HOURS PER WEEK | : 3 (Laboratories) |
| PREREQUISITES | : Static Electric Machines |
| CONDITION | : Required |

## II. SUMMARY OF COURSE

The course prepares students to recognize the technical characteristics and operation of electrical transformers. Using electrical equipment and measuring instruments in various types of electrical connections single and three phase transformers will be installed, determining the parameters of the transformers and the characteristics according to the type of load; presenting and supporting technical report on each experiment conducted.

## III. COURSE OUTCOMES

The student:

1. Weapon circuits inserting electrical measuring instruments for the main tests of a transformer.
2. Explains the main technical characteristics of a transformer.
3. Understands and applies the concepts of static electrical machines to determine vacuum parameters, parameter short, efficiency and regulation of a transformer.
4. It recognizes and explains the role the main parts of a transformer.
5. Performs various single-phase transformers connections to build a three-phase connection.

## IV. TEACHING UNITS

### 1. THE REACTOR WITH IRON CORE / 3 HOURS

Theoretical Explanation / Armed circuit / Making Experience / Presentation of report results.

2. TRANSFORMER MONOFASICO / 3 HOURS

   Theoretical Explanation / Armed circuit / Making Experience / Presentation of report results.

3. THE DRY TYPE TRANSFORMER THREE PHASE / 3 HOURS

   Theoretical Explanation / Armed circuit / Making Experience / Presentation of report results.

4. BANK IN CONNECTION SINGLE PHASE THREE PHASE TRANSFORMERS: Yy - Dd / 3 HOURS

   Theoretical Explanation / Armed circuit / Making Experience / Presentation of report results.

5. BANK IN CONNECTION SINGLE PHASE THREE PHASE TRANSFORMERS: Dy; yd / 3 HOURS

   Theoretical Explanation / Armed circuit / Making Experience / Presentation of report results.

6. TRANSFORMERS SINGLE PHASE PARALLEL / 3 HOURS

   Theoretical Explanation / Armed circuit / Making Experience / Presentation of report results.

7. THE SINGLE PHASE AUTOTRANSFORMER/ 3 HOURS

   Theoretical Explanation / Armed circuit / Making Experience / Presentation of report results.

8. COOLED THREE PHASE TRANSFORMER OIL / 3 HOURS

   Theoretical Explanation / Armed circuit / Making Experience / Presentation of report results.

V. LABORATORIES AND PRACTICAL EXPERIENCES

Laboratory 1: Iron Core Reactor.
Lab 2: Single-phase transformer.
Lab 3: Three Phase Dry Type Transformer.
Lab 4: Transformer Bank Connection Single Phase Three Phase:
Yy Dd.
Lab 5: Transformer Bank Connection Single Phase Three Phase:
Dy Yd.
Laboratorio 6: Transformadores Monofásicos en Paralelo.
Laboratorio 7: El Autotransformador Monofásico.
Laboratorio 8: El Transformador Trifásico refrigerado en aceite

## VI. METHODOLOGY

The course is developed in laboratory sessions, each session is a brief summary of the theoretical basis of the experience to be performed, how to set up the circuit and how to perform the experimental tests. The report of the results obtained in the experience are presented in the following session of the same and are exposed by the students. In all the sessions the active participation of the student is promoted.

## VII. FÓRMULA DE EVALUACIÓN

Evaluation System "D". Calculation of Final Average: PF = (PL1 + PL2 + PL3 + PL4 PL5 & PL6 + PL7 + PL8) / 8 PL1: Practice Lab 1 PL2: Practice Lab 2 PL3: Practice Lab 3 PL4: Practice Laboratory 4 PL5: Practice Laboratory 5 PL6: PL7 Laboratory practice 6: Laboratory practice 7 PL8: 8 Laboratory practice.

## VIII. BIBLIOGRAPHY


1. STEPHEN J. CHAPMAN. Electric machines. Editorial Mc Graw Hill, 2000.
2. HARPER ENRIQUEZ. The Practical Book of Generators, Transformers and Electric Motors. Editorial LIMUSA, 2005.