NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRONICS ENGINEERING PROGRAM

EE441 – LABORATORY OF ELECTRONICS I

I. GENERAL INFORMATION

CODE	**:**	EE441 – Laboratory of Electronics I
SEMESTER	**:**	6
CREDITS	**:**	01
HOURS PER WEEK	**:**	03 (Laboratory)
PREREQUISITES	**:**	Electronics Circuits I
CONDITION	**:**	Mandatory

II. COURSE DESCRIPTION

The course prepares the student in the handling of laboratory instruments, use and implementation of manuals and catalogs of components, construction and analysis of rectifier circuits, filters, single stage and multistage amplifiers and regulated sources. Application practices in engineering are developed and simulation software is used.

III. COURSE OUTCOMES

At the end of the course the student will:

- Select correctly the equipment, instruments and components to use according to the experience to be developed.
- Correctly manage measuring and visualization equipment and instruments, configuring and connecting them properly.
- Have the ability to measure variables accurately and verify the consistency of the values obtained.
- Use simulation software and compare with the experimental results.
- Correctly interpret the results obtained and formulate conclusions.
- Prepare clear technical reports using an established digital format, detailing the laboratory process developed, delivering on time.
- Integrate to work groups and actively participates aiming at the achievement of the objectives.
- Raise awareness on environmental issues by encouraging the use of Information and Communication Technologies - zero paper policy.

IV. LEARNING UNITS

1. VOLTAGE FILTERS AND FILLERS

Capacitor input / inductor input filters, section L / Voltage multipliers.

2. **USE AND MANAGEMENT OF THE MULTIMETER, OSCILLOSCOPE, DIODE CURVES**
   Ohm measurements, AC and DC voltages and currents / instrument sensitivity / Scales, phase, frequency / half-wave and full-wave rectifiers.

3. **THE BIPOLAR TRANSISTOR. POLARIZATION GAINS**
   Obtaining technical data from the transistor manufacturer's manuals to be used / Polarization in the different work areas / EC, BC and DC configurations / AC and DC load lines / Voltage and current gains / Frequency response / Impedance measurement input

4. **AMPLIFIER WITH COMMON BASED BIPOLAR TRANSISTOR, COMMON ISSUER AND COMMON COLLECTOR**
   Determine the characteristics of the amplifier / Voltage and current gains / Phase determination / Measurement of the input and output impedance.

5. **REGULATED SOURCES-IC AND DRIVERS OF CURRENT**
   Discrete regulated source / Measurement of the range of variation of the output voltage / Application of an integrated regulator.

6. **AMPLIFIER WITH FET TRANSISTOR**
   Obtaining technical data from the manufacturer's manuals / Polarization in the different work zones / DC, SC and GC configurations / AC and DC Load Lines / Voltage Gain / Frequency response / Input impedance measurement.

7. **MULTI-STAGE AMPLIFIER**
   Polarization of the stages / Measurement of the operating points / Obtaining voltage gains / Measuring the input impedances.

8. **FREQUENCY RESPONSE IN MULTIETAPAS**
   Obtaining the Bode diagram of a Two-stage Amplifier / Determination of Cutoff frequencies.

9. **MINI PROJECT (additional)**
   Realization of a free work that includes the points reviewed in this course.

V. METHODOLOGY

The course is developed in laboratory practice sessions, a series of questions are posed by means of a digital format established for the report prior to being presented before the experience is completed and a digital format established for the final report to be presented after the completion of the experience. The use of pre-practice simulation software is promoted. In all sessions, teamwork and student leadership are promoted.

VI. EVALUATION FORMULA

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

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

$$FA = \frac{PE + FE + P}{3}$$

VII. BIBLIOGRAPHY

- Boylestad Nashelsky, "Electronic Circuit Theory".
- Lilen, "Thyristors and Triacs"
- Millman and Halkias, "Integrated Electronics".
- Shilling and Belove, "Discrete and Integrated Electronic Circuits". Leonard Strauss, "Wave Generation and Shaping".
- Instrument Manuals and Manufacturers of Components.