NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF GEOLOGICAL, MINING AND METALLURGICAL ENGINEERING

METALLURGICAL ENGINEERING PROGRAM

ME315 – ELECTRICAL ENGINEERING

I. GENERAL INFORMATION

CODE	**:**	ME315 Electrical Engineering
SEMESTER	**:**	5
CREDITS	**:**	3
HOURS PER WEEK	**:**	5 (Theory – Practice)
PREREQUISITES	**:**	FI403 Physics III
CONDITION	**:**	Compulsory

II. COURSE DESCRIPTION

The course aims to provide students with basics of electricity for the design of indoor and outdoor electrical wiring in buildings, industrial and mining plants. It encompasses direct current circuits, single-phase and three-phase alternating current circuits, building, industrial and mining wiring, primary and secondary electrical networks, lighting, electrical sub-stations, vertical transport, diesel generator, electric power station.

III. COURSE OUTCOMES

1. Learn electric power applications in buildings and industrial facilities. Analyze and calculate direct current circuits.
2. Analyze and calculate single-phase and three-phase alternating current circuits.
3. Design indoor electrical wiring for housing and buildings.
4. Apply current design rules and regulations.
5. Identify and learn the application of several types of light fixtures.
6. Identify several types of electrical substation.
7. Select diesel generators for power supply in works as emergency diesel generator.
8. Learn electric power station operation principles.

IV. LEARNING UNITS

1. IMPORTANCE OF THE ELECTRICITY / 5 HOURS

Importance of the electricity. Generation, transmission and distribution / National Interconnected System / Electricity charges / Peruvian energy situation.

2. DIRECT CURRENT CIRCUITS / 10 HOURS

Fixed and variable circuit parameters / Ohm's law / Kirchhoff's laws / Series and parallel circuits / Direct current circuits' analysis / Solution to application problems.

3. SINGLE-PHASE, THREE-PHASE AND ALTERNATING CURRENT CIRCUITS / 12 HOURS

Alternating current single-phase circuits / Active power, apparent power, idle power and power factor / Star connection and delta connection / Three-phase circuit power / Examples, application problems.

4. HOME ELECTRICAL WIRING / 15 HOURS

Primary and secondary electrical networks, aerial and underground wiring / Electrical transformation substation in buildings, schemes of principle, building sizing, equipment disposal / Loads and people vertical transportation, main components, basic sizing. Operation condition, civil works.

5. ELECTRIC POWER GENERATION / 10 HOURS

Diesel generators, types, premise sizing. Equipment assembly. Ventilation. Equipment disposal / Hydroelectric power station. Types of turbines. Equipment disposal. Design conditions. Civil works / Thermal power station, steam turbines, gas turbine. Equipment disposal. Civil works.

V. METHODOLOGY

This course is carried out in theoretical and practical sessions. In theoretical sessions, the instructor introduces concepts, theorems and applications, complementing with available audiovisual aids and encouraging the active participation of the students. In practical sessions, problems are solved and their solutions are analyzed with the participation of the students, likewise students are given individual homework.

VI. EVALUATION FORMULA

The final grade PF is calculated as follows:

PF = 0.3 EP + 0.3 EF + 0.2 PP + 0.2 TE

EP: Mid-Term Exam EF: Final Exam
PP: Average of three quizzes TE: Average of two design projects

VII. BIBLIOGRAPHY

1. **NATIONAL ELECTRICITY CODE VOLUME I, IV, V.**
   National Direction of Electricity. Energy and Mining Department, 2006

2. **RICHART C, DORF**
   Electric circuits, Introduction to Analysis and Design
   Alfa Omega Editorial, 2005

3. **KERCHNER AND CORCORAN**
   Alternating Current Circuits
   CESCA Editorial, 2006

IX. COURSE CONTRIBUTIONS TO STUDENT OUTCOMES ATTAINMENT

Course contributions to Student Outcomes are shown in the following table:

Level 1: Know
Level 2: Comprehend, calculate
Level 3: Model, apply, solve
Level 4: Apply at advanced level, design. Achievement of Student Outcome

Outcome	Contribution
1. Engineering Design Design and integrate metallurgical systems and components satisfying requirements and needs as well as given technical, economic, social and legal constraints and limitations.	2
2. Problem solving Identify, formulate and solve engineering problems properly using the methods, techniques and tools of metallurgical engineering.	3
3. Sciences Application Apply the knowledge and skills of mathematics, sciences and engineering to solve metallurgical engineering problems.	3
4. Experimentation and Testing Conceive and conduct experiments and tests, analyze data and interpret results.	3
5. Modern Engineering Practice Use and apply techniques, methods and tools of modern engineering necessary for the practice of metallurgical engineering.	3
6. Engineering Impact Understand the impact of metallurgical engineering solutions on people and society in local and global contexts.	3
7. Project Management Determine the budgets, schedules and feasibility of engineering projects, and participate in its management for the attainment of goals.	
8. Environmental Appraisal Take into account the importance of preserving and improving the environment in the development of their personal and professional activities.	
9. Lifelong Learning Recognize the need to keep their knowledge and skills up-to-date according to advances of metallurgical engineering and engage in lifelong learning.	3
10. Contemporary Issues Know and analyze relevant contemporary issues in local, national and global contexts.	
11. Ethics and Professional Responsibility Evaluate their decisions and actions from a moral perspective and assume responsibility for the executed projects.	
12. Communication Communicate clearly and effectively in oral, written and graphical formats, interacting with different types of audiences.	3
13. Teamworking Appraise the importance of teamworking and participate actively and effectively in multidisciplinary teams.	3