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

ML520 – TRANSMISSION LINES

I. GENERAL INFORMATION

CODE : ML520 Transmission Lines
SEMESTER :10
CREDITS : 3
HOURS PER WEEK : 4 (Theory - Practice - Laboratories)
PREREQUISITES : Power System
CONDITION : Mandatory

II. COURSE DESCRIPTION

The course gives students a technical-economic vision of design of transmission lines, emphasizing the high and extra high voltage.

On the technical side, as students to careers related mechanical and electrical, the course provides an overview of the electrical and mechanical analysis of transmission lines.

In addition to the economic side, the model of "Least Cost" or minimal cost to the selection of alternatives is used.

III. COURSE OUTCOMES

The student will:

1. Combine and physical phenomena associated with the technical criteria used in the design of a transmission line.
2. Perform the basic design of a line of Transmission-distribution based on the National Electrical Code - Supply 2011.
3. Analyze the environment of a proposed transmission / distribution and make decisions either from the part of regulatory agencies supply (power companies) or demand (mining companies, etc).
4. Propose and evaluate alternative power transmission through a technical-economic evaluation, recommending lower cost.

IV. LEARNING UNITS

1. INTRODUCTORY ITEMS (6 HOURS)

- The transmission lines and electrical systems in Peru, interconnected and isolated electrical systems.
- Impact of the lines in the interconnected systems.
- Specialties involved in projects of transmission lines.
- Types of power transmission: HVDC transmission, Features and components; Transmission HVAC, features and Components.
- Materials and standard voltages of Peru and other experiences: Distribution and Transmission.
- Route Selection of the transmission line. Criteria.

2. ELECTRICAL TRANSMISSION LINE (15 HOURS)

- Electrical parameters of the line. Models and T.
- Longitudinal and transverse line elements.
- Corona effect in lines. Line models of high, medium and short length.
- Natural - Power transmission line
- Operating line Regimes.
- Power and energy loss in a line. Transport efficiency power.
- Regulation of voltage transmission lines.
- Compensation Reactive lines: capacitors, reactors and SVC - Regime vacuum and short circuit.
- Criteria and Economic Section Line Voltage.
- Testing and thermal and electrical calculations. Ampacity and transmission capacity. Criteria for determination.
- Reactive Compensation Systems lines. Capacitors, reactors and SVC. Shunt and series compensation.
- Configuration and electrical equipment lines. Lines and radio systems and ringed.
- Bays transmission lines and switchgear - Design insulation transmission line.
- Types of insulators used in lines. Basic insulation level. Creepage distance and number of insulators.
- Over-voltages and Insulation coordination: Types of line surge and overvoltage protection equipment.
- Atmospheric discharge lines. Cables guard and Corners protective structures.
- Grounding System of transmission lines. Types PAT.
- Voltage step and touch. Resistivity measurements and improvement techniques PAT.
- Environmental impact of transmission lines.

3. MECHANICAL ASPECTS OF TRANSMISSION LINES (12 HOURS)

- Mechanical calculation of line conductors
- Equation of state change. Throw in points catenary
- Hypothesis mechanical calculation. Mechanical behavior curves - Weight and drivers Overloading in ice and wind
- Vano equivalent and voltage of each day (EDS or TDC)
- Cable keeps in transmission lines
- Creep Effect and Effect Galloping in Transmission Lines - Material selection and mechanical calculation of structures
- Types of structures to support driver. Defining height of the structures. Clearances.

- Criteria for determining the weight of the structures.

4. SPECIAL TOPICS (9 HOURS)

- Transmission Systems Reliability and High Voltage Cables
- Systems FACT applied to transmission systems
- Telecommunications Systems PLC on transmission lines

V. METHODOLOGY

The course develops theories sessions, practice. In the theory sessions, the teacher presents the concepts, theorems and applications. In the practical sessions, various problems are solved and the solution is analyzed. At the end of the course the student must submit and present a project. In all sessions active student participation is encouraged.

VII. EVALUATION FORMULA

Evaluation System "D".
Calculation of Final Average: PF = (PC1 + PC2 + PC3 + M) / 4.
Where: PC1: Qualified Practice 1 PC2: Practice rated 2 PC3: Practice qualified 3 and M: Monograph.

VIII. BIBLIOGRAPHY

1. Electrical Power Systems Prentice Hall 2003
   Gomez Antonio Esposito and others.
2. Power System & Stability Pradha Kundur
3. Electrical Power Systems
   Wadwha CL - Edit. John Wiley & Sons 1991
4. Energy Transportation Lines
   Luis Maria Checa - Edit. Marcombo 1978
5. New Regulatory Framework Lima Electricity, Electricity Tariffs Commission 1992
6. ABB Transmission & Distribution Handbook - Westinghouse 1992
7. Networking and Power Systems Petrenko LI - Edit. Vysha Shkola Kiev 1985
8. Electromechanical Transient Processes in Power Systems Venikov - Edit. Mir Moscow 1988
9. Compendium of Standards Lima Sector Electricity, Ministry of Energy and Mines 1999