



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

**ELECTRONICS ENGINEERING PROGRAM**

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**EE446 – RESEARCH PROJECT**

**I. GENERAL INFORMATION**

<b>CODE</b>	: EE446 – Research Project
<b>SEMESTER</b>	: 10
<b>CREDITS</b>	: 04
<b>HOURS PER WEEK</b>	: 06 (Theory – Practice)
<b>PREREQUISITES</b>	: EE445 – Capstone Project EE435 – Industrial Electronics
<b>CONDITION</b>	: Mandatory

**II. COURSE DESCRIPTION**

It is a practical theoretical course aimed at providing the future Electronic Engineer and Telecommunications Engineer with a solid base that allows them to develop any work and research and to present their results through an article, a report or a thesis, which could be the bachelor's thesis or grade thesis. Plan, project its development for presentation in writing and orally; quantitative and qualitative research, scientific research, the functions of thinking and scientific research, knowledge and knowledge, methodology and methods, methodological aids, the problem, the objectives of a scientific research, the benchmark or comparative pattern of research applied scientist, explanatory hypothesis of scientific research, factors and variables in explanatory scientific research, the design of the execution, how to determine the index of the thesis, how to develop the foundation, how to develop the methodology, how to prepare and collect field data, how to develop results, how to develop analysis, how to develop conclusions.

**III. COURSE OUTCOMES**

At the end of the course the student will:

- Learn how a research project is born, how the problem statement is developed.
- Learn how the Theoretical Framework of a research project is developed.
- Understand how the research type is selected.
- Understand how a hypothesis is formulated and how variables are defined conceptually and operationally.
- Learn how experimental research is done.
- Learn how non-experimental research is done.
- Understand how data collection is performed and the procedures for its analysis.
- Understand how to write and present the research paper report.

## **IV. LEARNING UNITS**

### **1. SCIENTIFIC RESEARCH**

Relate Scientific Research with its assumptions and budgets. Relate movements, changes and evolution. Specify the basic conditions of those who can do scientific research. Relate the purpose of science and that of a science, with the general objective of a scientific investigation. Relate the theoretical and operational ideals of a science with the kinds of research for its purposes, functions and levels that can be achieved.

### **2. THE THINKING FUNCTIONS AND SCIENTIFIC RESEARCH, TO KNOW AND KNOWLEDGE**

Review the thinking functions, specifying their individual structural relationships and each other. Contribute to operationalize the conceptual analysis, with the contribution of procedures to compare concepts that can be confused, and, to formulate our own concept. Relate the functions of judging and reasoning with the mechanism of deduction, of the type of logical thinking. Specify and distinguish the process of knowing, and, knowledge as your product. Present some categories attributable to the product of knowledge: the propositional statements of knowledge. Warn about the difficulties for the perception of objective knowledge.

### **3. METHODOLOGY AND METHODS, METHODOLOGICAL AID**

Specify and relate the concepts of methodology, method, system and strategy. Present the general method of scientific research as the macro strategy that integrates and concatenates, the required activities with the necessary order, which a research method should have to be scientific. Review the types of methods that can be done in a scientific research. Present as new to the method of all concrete scientific research, precisely because it considers and develops the activities of the general method of scientific research and combines various types of methods already known. Present a proposal for a general method for solving operational problems. Show their main similarities with the general method of scientific research, as well as their differences mainly in terminology. Present the graphic and literal schemes of the explanatory factual investigations, as well as the steps that are generally followed to obtain the final report of the research or thesis. Relate what is done in the entities, institutions or companies, with the methodological aids that correspond to each level of difficulty: execute actions, solve repetitive problems with a known solution, solve new problems for some, or finally, solve new problems for humanity. Show the convenience of dosing and proportionality between the problem faced in reality, with the level of help that is decided to apply.

### **4. THE PROBLEM**

Choose a part of reality (affected by the problem) that will be taken as the object of study or research. Identify and name problems well, presenting them together with the problem (list of problems that affect that part of reality). Prioritize (provisionally), select and integrate the problem to try to solve. Identify the number of parts and the priority (final) of those parts of the selected problem. Name the prioritized-selected and integrated problem, which will begin the formulation of the plan. Interrogatively formulate the selected problem. Specify the limitations of the investigation. Integrating everything, write the thesis plan number.

### **5. THE OBJECTIVES OF A SCIENTIFIC RESEARCH**

Submit the question: Why? As a purpose accelerator. Specify the levels, attributes and semantic designations that correspond to each purpose. Present the joint and inverse sequences that correspond to the planning and execution of an investigation. Specify the differences between research objectives with other types of objectives. Present the elements of the general objective of an investigation. Specify how to disaggregate each of the specific objectives of the general objective, and how to specify or specify them, based on the mention, of which the variables will then be. Follow the writing sequences of the general objective and the specific objectives.

## **6. THE REFERENTIAL FRAMEWORK OR COMPARATIVE PATTERN OF APPLIED SCIENTIFIC RESEARCH**

Offer applicable informative contents that allow the researcher to: locate, specify, understand, select and incorporate the subcomponent factors, most appropriate to the referential framework of the thesis, as element B of its general objective. Of the sub factors of the referential Framework, specifying the variables that depend on the chosen sub factor. These variables will be: theoretical, regulatory, market, environment (local, national or regional), international context, or on successful experiences or established errors , that are necessary to make enough the referential framework, to be used as a comparative pattern of the analysis of reality.

## **7. EXPLANATORY HYPOTHESIS OF SCIENTIFIC RESEARCH**

Being able to use logical-mathematical matrices, to raise sub hypotheses and the global hypothesis of each investigation or thesis.

## **8. FACTORS AND VARIABLES IN EXPLANATORY SCIENTIFIC RESEARCH**

Identify the variables with respect to which to cross in the sub hypotheses, it is necessary to obtain, from their respective domains, the data that will be used later to be able to contrast the sub hypotheses. Define the identified variables by extension or understanding. Classify the variables, already identified and defined, by causal relationships, by quantity and by hierarchy.

## **9. THE EXECUTION DESIGN**

Specify what the Design of the execution of an investigation or thesis includes. Orient, How is the research universe determined? Guidance on the selection of techniques, instruments and informants or sources to obtain the data. Orient, How to determine if there is going to be a sample, and if there is, if it is going to be more than one or only one? Guidance on the forms of Data Processing and Information Analysis. Specify how to prepare the execution schedule.

## **10. HOW TO DETERMINE THE THESIS INDEX**

Guidance regarding the criteria or decision guidelines that they can count on to decide with foundation, common sense and operability, the parts, Chapters, Numerals, Sub numerals, Letters, Scripts or equivalents and Points necessary, to give it a structure, correctly hierarchized and logically concatenated, at the end of the thesis.

## **11. THE EXECUTION DESIGN**

To guide the researcher, regarding the criteria or decision guidelines they can count on to decide, based on, common sense and operability: How and from where? Obtain and how to present the data and information to be considered in the numerals, sub-numerals, dashes or lines and points of the Referential Framework, to be used as a necessary and sufficient comparative pattern.

## **12. HOW TO DEVELOP THE METHODOLOGY**

To guide the researcher, regarding the criteria or decision guidelines that they can count on to decide, based on, common sense and operability, from where, how to obtain and how to present the data and information to consider in the numerals, sub-numerals, scripts or lines and points of the Methodology.

## **13. HOW TO PREPARE AND COLLECT FIELD DATA**

Guide the researcher regarding the criteria or decision guidelines so they can count on deciding, based on, common sense and operability: How to develop the instruments to collect the field data?

## **14. HOW TO DEVELOP RESULTS**

To guide the researcher, regarding the criteria or decision guidelines that they can count on to decide, with foundation, common sense and operability how to develop the Chapter: Description of ... (To Reality, as part of the thesis results).

### **15. HOW TO DEVELOP ANALYSIS**

To guide the researcher regarding the criteria or decision guidelines they can count on to decide, based on common sense and operability, the analysis of the contents of their numerals, sub numerals, letters, scripts and guidelines.

### **16. HOW TO DEVELOP THE CONCLUSIONS**

Guidance counselor, regarding the criteria or decision guidelines they can count on to decide; with foundation, common sense and operability: How to develop the chapter: Conclusions of the Thesis?

## **V. METHODOLOGY**

The teaching methodology of the course consists of: Expository theoretical classes according to the scheduled content of the course. Practical classes where application examples are developed on topics presented in the theoretical classes. Tasks that students must develop for complete learning of the exposed topics.

## **VI. EVALUATION FORMULA**

The learning will be evaluated through the "D" system.  
The final average is equal to the practices average.

## **VII. BIBLIOGRAPHY**

- HERNANDEZ SAMPIERI, Roberto, HERNANDEZ COLLADO, Collado, BAPTISTA LUCIO, Pilar. Investigation methodology. Publisher: Mc Graw Hill, 6th edition, 2010.
- CABALLERO ROMERO, Alejandro E. Innovations in the methodological guides for the master's and doctoral thesis plans and thesis. Editorial: ALEN CARO Methodological Institute, 2nd Correct Print, 2010.