NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF MECHANICAL ENGINEERING
MECHATRONICS ENGINEERING PROGRAM

MC601 – RESEARCH METHODOLOGY

I. GENERAL INFORMATION

COURSE CODE   : MC601 Research Methodology
GRADE   : 9
CREDITS   : 2
HOURS PER WEEK   : 4 (Theory – Practice)
PREREQUISITES   : MB536
CONDITION   : Mandatory

II. COURSE SUMMARY

The course provides the student with several techniques that allow him to develop his life plan, considering different aspects, such as educational, financial, attitudinal, family, etc. This step is essential before proceeding with the choice of a research project, which should be in accordance with the developed life plan. Then, the course develops the fundamentals of the bibliographic search for technical information, through the use of tools such as Google Scholar. Finally, the principles are given to select and develop a scientific / technical problem. Hypotheses are developed and tools are provided to test them rigorously.

III. COURSE OUTCOMES

The student:

1. Develops a life plan considering various aspects: educational, financial, attitudinal, family, etc
2. Seeks and evaluates the relevance of bibliographic information of a technical nature through the use of specialized search engines
3. It identifies and defines scientific / technical problems that can be carried out and that are in accordance with its life plan and the national reality.
4. Develops a hypothesis as a possible solution to the problem.
5. Evaluates the hypothesis raised using rigorous statistical tools.

IV. LEARNING UNITS

1. DEVELOPMENT OF A LIFE PLAN / 12 HOURS

Labor demand for mechanical engineers and related branches in Peru / Situation of the FIM graduates in the Peruvian labor market / Most important economic sectors in

Peru / Development of the life plan using the XMind tool / Development of a personal / Development of a CV.

2. BIBLIOGRAPHIC SEARCH AND SELECTION OF RESEARCH SUBJECT / 12 HOURS

Bibliographic search of technical information using Google Scholar / Evaluation of the quality and relevance of the information obtained / Selection of a research topic according to the life plan and the national reality / Differences and similarities between research projects and engineering projects.

3. DEVELOPMENT OF HYPOTHESIS TO SOLVE THE PROPOSED PROBLEM / 12 HOURS

Failure modes and effects analysis (FMEA) / Root cause analysis (RCA) / Brainstorming methodology / Cause-effect diagrams / Process-system diagrams / 5 Porter forces / Pareto diagram / Diagram of Decision tree / Force field analysis

4. HYPOTHESIS TEST / 16 HOURS

Sample selection / Quantitative data collection / Analysis of quantitative data using MS Excel / Pearson correlation coefficient / Analysis of variance (ANOVA) / Reporting of results / Preparation of presentations-oral and written reports.

V. METHODOLOGY

The course is developed in theoretical sessions in classroom and practices in computer lab. In theory sessions, the teacher presents the concepts, tools and techniques necessary to carry out the various tasks of the course. In the practical sessions, various tasks are performed, such as XMind use for life plan, search of bibliography in Google Scholar, use of Excel for data analysis, among others. The evaluation of the course consists of 3 monographs, one individual (life plan) and two in groups, in which the students must carry out a research work in a collaborative way. In all the sessions the active participation of the student is promoted.

VI. EVALUATION FORMULA

Evaluation system "D". Course evaluation is the average of 3 monographs. Calculating the final grade: FG = (M1+M2+M3)/3

VII. BIBLIOGRAPHY

1. **Hernández Sampieri R, Fernández Collado C, Baptista Lucio M.** Metodología de la investigación. McGraw Hill, 2010.r. CRC Press
2. **Kumar R.** Research Methodology, SAGE publications, 2011.
3. **Dandy G, Walker D, Daniell T, Warner R.** Planning and Design of Engineering Systems. Taylor & Francis, 2008.
4. **Mind Tools.** The Mind Tools EBook. Mind Tools Limited, 2007.
5. **Trevelyan JP. The Making of an Expert Engineer. CRC Press, 2014.**