



**NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF MECHANICAL ENGINEERING
MECHANICAL ENGINEERING PROGRAM**

MC214 – MANUFACTURING PROCESSES II

I. GENERAL INFORMATION

CODE	: MC214 Manufacturing Processes II
SEMESTER	: 5
CREDITS	: 5
HOURS PER WEEK	: 07 (Theory 04 – Labs 03)
PRERREQUISITES	: MC213 – Manufacturing Processes I
CONDITION	: Mandatory

II. COURSE DESCRIPTION

It is a theoretical-practical subject, with the purpose that the student sustains the use of a certain process for the design, elaboration, improvement and optimization in the manufacture of a product according to its characteristics in accordance with the standards and technical standards in force.

III. COURSE OUTCOMES

The student:

1. Manages the different manufacturing processes to determine the most appropriate, depending on the characteristics of the desired product, the optimization of its manufacturing and correspondence cost quality, respecting the environment, and meeting the standards according to national and international standards.
2. Applies the different methods and equipment to be used to obtain the castings by assessing the characteristics necessary for their application and the safety programs verifying the quality, the properties of the final product and the application of the standard.
3. Selects the adequate process of forming to the product and its characteristics for use, optimizing the product and manufacturing in accordance with current regulations.
4. Contrasts the different processes of plastic deformation with the purpose of determining the most suitable for the manufacture of a product.
5. Selects the welding process to use according to the characteristics of the joint in order to determine the most appropriate; elaborating the formats according to technical and international standards, verifying the fulfillment of the necessary technical characteristics.

IV. LEARNING UNITS

1. METAL CASTING PROCESSES / 35 HOURS

Metal casting fundamentals / Process Characteristics / Stages and operations / Contraction and times of solidification / Models / Conditions for the design of castings / Molds / Sand Casting / Design of feeders / Thrust calculation / Chaplets / Quality of casting / Other casting processes.

2. POLYMER FORMING / 8 HOURS

Properties of polymers / Classification / Processes of forming of the polymers: Compression Molding, transferential and rotational / Thermoformed / Forming of elastomers / Conformation of composites materials.

3. METAL FORMING BY PLASTIC DEFORMATION / 25 HOURS

Generalities of metal plastic deformation / State of stress / Effects of temperature of plastic deformation / Volumetric deformation processes: Lamination, Drawing, Forging y Extrusion / Work of sheets: Deep Drawing, Rolling, Die cutting and Punching / Boilermaking.

4. WELDING / 26 HOURS

Welding fundamentals / Soft Welding / Strong Welding / Welding by base metal casting: Arc Welding / Preparation of mechanical joints / Welding in pasty state / Welding Defects / Construction of containers / Cutting equipment / Costs.

5. PROCESSING OF METAL AND CERAMIC PARTICLES / 4 HOURS

Powder metallurgy: Product application / Processing: Obtaining of metal powders, sintered, compaction / Ceramics: Application of ceramics / Processing: Obtaining the raw material, processes of forming of objects of ceramics, treatment and finishing.

V. LABORATORIES Y PRACTICAL EXPERIENCES

- Lab 1: Casting Process
- Lab 2: Volumetric Deformation Process
- Lab 3: Work of Sheets
- Lab 4: Welding Process
- Lab 5: Cutting processes

VI. METHODOLOGY

Theoretical-practical classes that are oriented to promote the student's active participation, through the use of specialized laboratories, promoting evidence-based learning through the practical development of applications. Interaction with students is permanent (dialogues, debates and problem solving), teamwork in the classroom and reflective self-learning through project methods, case review and / or research tasks.

VII. EVALUATION FORMULA

Evaluation system "F". Calculation of final grade: $FG = (ME + 2FE + QA)/4$

MT: Midterm exam FT= Final exam

QA: Quizzes average

There will be four quizzes, the quiz with the lowest grade will not be taken in consideration.

VIII. Bibliography

1. GROOVER, Mikell. "Fundamentos de Manufactura Moderna". Edit. Prince Hall, 4th edition 2010
2. KALPAKIJAN, Serope. "MANufactura, Ingeniería y Tecnología". Edit. Prince Hall, 5th edition
3. DESLANDES Y VANDERBERGHE "Modelos y Moldes para Fundición" Edit. UTEHA.