ICM2423 MECHANICS OF PLASTIC SOLIDS

Credits and contact hours: 10 UC credits / 10 hours (3 hours in lectures and 7 individual work hours per week)

Instructor’s name: Miguel Vial Cruz

Course coordinator’s name: To be defined

Textbook:

Course Catalog Description: This course focuses in the application of concepts of plasticity, engineering design and industrial production.

Prerequisite Courses: ICE1302 Mechanics of Solids; ICM1202 Engineering Materials

Co-requisite Courses: None

Status in the Curriculum: Minimum course

Course Learning Outcomes:
1. To use mechanics of plastic solids to calculate metal forming process.
2. To determine the forming limits that lead to failure in the manufactured product.
3. To identify and assess the factors in forming matrices that optimizes process.

Relation of Course to ABET Criteria:
- Knowledge of mathematics, science and engineering
- Design and conduct experiments: analyze and interpret data
- Design a system, component, or process
- Multidisciplinary teams
- Identify, formulate, and solve engineering problems
- Professional and ethical responsibility
- Effective communication
- Broad education necessary for global, economic, environmental and societal context
- Recognition of the need for, and an ability to engage in life-long learning
- Knowledge of contemporary issues
- Techniques, skills, and modern tools for engineering practice.
Topics covered:

1. Introduction and examples of forming processes.
2. Tensor notation.
5. Stress-strain relations: elastic deformation, plastic deformation, strain stiffening. Mechanical properties in function of temperature and strain rate.
7. Direct integration of constitutive equations.
8. Strength calculation in forming processes. Application to forging, rolling, extrusion, wire drawing and indentation:
   a) Method of uniform energy and ideal strain work
   b) Slice method (Sachs method), with friction.
   c) Upper limit method..
9. Forming processes in metal sheet:
   a) Circular and rectangular inlay. Redraw and ironing.
   b) Bending
   c) Ductile fracture.
   d) Complex stretching and stamping (limit deformation diagram).
   e) Cut
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