Universidad de La Sabana
Course Syllabi
Chemical Engineering

Catalogue Course Number: 150604

Particle Technology and Engineering

2. **Credits and contact hours:**
   Credits: 2, Contact hours: 4, Individual work hours: 3

3. **Text book, title, author, and year**
   Introduction to Particle Technology, Martin J. Rhodes. April 2008

a. **Other supplemental materials**
   • Particle Technology and Engineering. An Engineer's Guide to Particles and Powders: Fundamentals and Computational Approaches. Seville & Wu, 20 May 2016.
   • Fundamentals of Particle Technology. R. G. Holdich. 2002.

4. **Specific course information**

a. **Brief description of the content of the course (catalog description)**
   The intent of this course is for students to learn, identify, understand and apply the phenomena governing particles and bulk solids to the design and operation of industrial processes. Aspects related to the basic principles of operation of related technologies, the state of the same, the selection criteria and some design algorithms will be considered. All of this will be studied using equations and models developed for this type of systems.

b. **Prerequisites or co-requisites**
   Prerequisites: – 21502 *Transport phenomena*

c. **Indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program**
   Required

5. **Specific goals for the course**

a. **Specific outcomes of instruction**,
   The student will be able to:

- Understand the fundamentals governing the characterization and performance of particulate systems.
- Critically analyze situations involving particle and bulk solids handling
- Propose solutions that will improve the efficiency of equipment and processes

b. **Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.**

- Student Outcomes A, B and G

6. **Brief list of topics to be covered**

- What is particle technology and what are particles
- What is known
- What are the applications
- Shape: Basic measurement and Shape factor
- Size: Definitions, Functions, Measurement methods and Distribution
- Density: Solid density, Bulk density, Tapped density, Void fraction and porosity
- Surface area
- Flowability: Angle of repose, Angle of spatula, Hausner ratio, Carr Index, flow meters and powder rheometers.
- Compresibility: Heckel equation, Kawakita equation and Adams equation
- Compactability
- Motion of Solid Particles in a Fluid
- Settling of a single particle in a fluid
- Drag Force
- Particle terminal velocity
- Non-Spherical Particles
- Effect of Boundaries on Terminal Velocity
- Settling of a Suspension of Particles
- Hindered systems: settling and zone theory
- Batch Settling
- Pressure drop –vs- flow relationship
- Fluidization: minimum fluidization velocity, bubbles and types of fluidization
- Filtration
- Crushing, grinding and milling: classification and breakage/crushing laws
- Solid-solid mixing: types, equipment and cohesive powder mixing
- Friction and the Coloumb model
- Stress analysis and storage in vessels
- Stress analysis for compression of a powder bed
- Discharge dynamics: Hopper and silo flow, angle design and powder flow function.