

1. Course number and name

Catalogue number: 150503

Materials and Nanomaterials Science

2. Credits and contact hours

Credits: 3, Attendance hours: 4 per week, Autonomous work: 5 per week

3. Text book, title, author, and year

4. Specific course information

- a. Brief description of the content of the course (catalog description).
The course has the objective to build the basis of the study of materials for engineering applications. The first part of the class will explore the relationship between the electronic structure and chemical bonding and atomic order. The second part considers the properties of materials such as: Metals, polymers, ceramics and semiconductors. The third part considers the behavior of materials when the nanometer scale is reduced.
- b. Prerequisites or co-requisites. 21302 *Physics, electricity and magnetism*.
- c. Required.

5. Specific goals for the course

- a. Specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.
This course requires previous knowledge on basic statistics and operation management. Upon completion of this course, students will be able to function on teams to model systems with stochastic characteristics, then the students will be able to:
 - Design experiments: collect, choose and process data, using statistical tools.
 - Apply the steps of a simulation study.
 - Build models using specialized software.
 - Evaluate alternatives and interpret the statistical analysis results to take decisions.
- b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
 - Student Outcomes A and E

6. Brief list of topics to be covered

- Materials Science Definition
- Integral Definition of a property

Universidad de La Sabana
Course Syllabi
Chemical Engineering



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La Sabana

- Matter : Levels of Structure
- Bonding and Molecules
- Primary Bonding
- Secondary Bonding
- Electrical Properties
- Band Theory : Metals , Insulators , Semi- Conductors, Energy gap , doping ,applications.
- Crystalline Materials:
- Crystalline Structures, Bravais
- Lattices , miller index
- x-ray diffraction
- Defects : Point , line, surface
- Introduction to glasses
- Arrhenius Equation
- Diffusion : Ficks Laws
- Mechanical Properties of Materials.
- Deformation : Elastic and Plastic
- Solidification
- Solid Solutions:
- Phase diagrams , partial Solubility and full solubility
- Organic Materials
- Polymers
- Synthesis, properties and applications.
- Composite Materials
- Introductions to nanotechnology
- Quantum Systems
- Applications for nanotechnology