Materials Engineering

Institutional Mission Statement:

Provide quality higher technological education, developing well-rounded proficient professionals, with high sense of social responsibility, solid education in science, technology and innovation, who contribute to the sustainable development of the country.

Program Educational Mission:

Prepare ethical, competent professionals with leadership, entrepreneurial and creative attitude in order to design, research, develop, control, innovate and solve problems in the engineering and technology of traditional materials, advanced materials, biomaterials and nanomaterials, with an attitude oriented to the continuous learning, with abilities that allow them to become socially and professionally connected in the global context in fields such as the industrial, academic and related areas, and committed with sustainable development.

Student Outcomes:

(a) An ability to apply knowledge of mathematics, science, and engineering.
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
(d) An ability to function on multidisciplinary teams.
(e) An ability to identify, formulate, and solve engineering problems.
(f) An understanding of professional and ethical responsibility.
(g) An ability to communicate effectively.
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
(i) A recognition of the need for, and an ability to engage in life-long learning.
(j) A knowledge of contemporary issues.
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives (PEO´s):

- PEO1. Adapt to the evolution of technology and assume leadership in the solution of problems related to Materials Science and Engineering and similar disciplines.
- PEO2. Apply skills to acquire experience and knowledge in order to incorporate to new professional opportunities or continue in postgraduate studies.
- PEO3. Work in an honest, efficient and responsible manner, taking into consideration diversity and the multicultural social context.

Program Student Outcomes:

Note: These PSOs are official starting may 2016, according to a statement of "*Tecnológico Nacional de México*", and can be verified at www.tecnm/mx:

1. Understands and interprets the relationships between the structure, properties and processing of materials for their adequate selection according to their application.

2. Identifies, selects and applies processes for materials obtainment, transformation, fabrication and/or synthesis, in order to optimize them in a sustainable manner.

3. Applies scientific fundaments of materials engineering in order to obtain and modify the properties and structure of a material for a specific application.

4. Distinguishes and applies the different characterization and analysis techniques of materials in order to evaluate their physical, mechanical, chemical, and biological properties.

5. Analyzes and interprets the results of the different characterization techniques in order to ensure the quality of processes and products.

6. Detects, identifies and solves corrosion and degradation problems of materials in order to expand their service life.

7. Analyzes, organizes and synthetizes scientific information from different areas of materials engineering for the adaption, assimilation and innovation of emergent technologies (such as nanotechnology, biomaterials, optoelectronics, renewable energies, among others).

8. Plans and participates in the development of research and technological innovation projects to solve problems related with their professional development.

9. Designs, models and simulates processing and synthesis methods of materials to improve performance and functionality.

10. Leads and collaborates in interdisciplinary and transdisciplinary work teams in national and international contexts to improve their professional competencies

11. Recognizes and accepts a commitment to perform their profession responsibly, efficiently and honestly, considering the diversity and multiculturalism of their social context.

Courses of the educational program: Foundry Processes concentration.

Year 1 – Semester 1	
Research workshop	Ethics workshop
Differential calculus	Chemistry
Computer-aided drawing	Management fundamentals
Year 1 – Semester 2	
Probability and statistics	Metrology and statistics
Integral calculus	Linear algebra
Mineralogy and materials obtaining	Security and safety workshop
Complementary activities	
Year 2 – Semester 1	
Electricity, magnetism and optics	Classic mechanics
Vector calculus	Organic chemistry
Sustainable development	
Year 2 – Semester 2	
Analysis techniques	Solid state physics
Differential equations	Numerical methods programming
Thermodynamics in materials engineering	Polymeric materials
Quality control	
Year 3 – Semester 1	
Structural characterization	Phase diagrams
Non-ferrous metal production	Physical-chemical equilibrium
Momentum transport	Mechanic behavior of materials
Community service	
Year 3 – Semester 2	
Research workshop I	Phase transitions
Ferrous metal production	Kinetics
Corrosion and degradation of materials	Solidification
Molding and casting systems	Sand technologies
Year 4 – Semester 1	
Research workshop II	Heat treatments
Manufacturing processes	Ceramics materials
Mechanical failure analysis	Introduction to nanomaterials
Ferrous alloys casting	Non-ferrous alloys casting
Year 4 – Semester 2	
Projects formulation and evaluation	Composite materials
Introduction to biomaterials	Applied statistics
Casting process simulation	
Year 5 – Semester 1	
Internship	

Courses of the educational program: Advanced materials concentration.

Year 1 – Semester 1	
Research workshop	Ethics workshop
Differential calculus	Chemistry
Computer-aided drawing	Management fundamentals
Year 1 – Semester 2	
Probability and statistics	Metrology and statistics
Integral calculus	Linear algebra
Mineralogy and materials obtaining	Security and safety workshop
Complementary activities	
Year 2 – Semester 1	
Electricity, magnetism and optics	Classic mechanics
Vector calculus	Organic chemistry
Sustainable development	
Year 2 – Semester 2	
Analysis techniques	Solid state physics
Differential equations	Numerical methods programming
Thermodynamics in materials engineering	Polymeric materials
Quality control	
Year 3– Semester 1	
Structural characterization	Phase diagrams
Non-ferrous metal production	Physical-chemical equilibrium
Momentum transport	Mechanics behavior of materials
Community Service	
Year 3 – Semester 2	
Research workshop I	Phase transitions
Ferrous metal production	Kinetics
Corrosion and degradation of materials	Solidification
Advanced polymers	
Year 4 – Semester 1	
Research workshop II	Heat treatments
Manufacturing processes	Ceramics materials
Mechanical failure analysis	Introduction to nanomaterials
Molecular engineering	
Year 4 – Semester 2	
Projects formulation and evaluation	Composite materials
Introduction to biomaterials	Advanced composites and ceramics
Surface engineering	Simulation
Advanced materials	
Year 5 – Semester 1	
Internship	

Program's statistics

Semester Year	New students	Total students enrolled in the program	Graduates
Spring 2010	44	397	25
Fall 2010	80	432	33
Spring 2011	31	412	31
Fall 2011	71	419	13
Spring 2012	37	414	23
Fall 2012	68	423	35
Spring 2013	38	417	36
Fall 2013	68	434	37
Spring 2014	35	417	13
Fall 2014	66	448	32
Spring 2015	44	440	28
Fall 2015	71	462	-
Spring 2016	-	-	-