# ENGINEERING APPLIED SCIENCES



Tecnológico de Monterrey



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Where are these degrees offered?

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Degrees

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# MODEL TEC21 TEC CHALLENGES YOU

Our **challenge-based educational model** develops the competencies that will enable you to face up to the opportunities and challenges of the 21st century creatively and strategically.

With an education that will accompany you throughout your life, our aim is for you to be aware of the needs of the environment, acquire a systemic vision of problems and develop the capacity to solve them.

Right from the first semester, you will be participating in activities to develop your capacity to identify opportunities, find resources, take risks and recover from failure.

In addition, **the model empowers you** to make more decisions about your university studies as you progress, in order to **develop a unique profile.** 



### WHAT IS A CHALLENGE?

A challenge is an opportunity to learn something new and reinforce what you already know. To solve it, you need to apply yourself, investigate and interact in the "real world". You won't be on your own: you will have a set of personal and technological resources and tools, as well as the advice of faculty who will accompany you throughout the process. Its resolution implies a certain degree of difficulty and a duration that will awaken your interest and enthusiasm and produce a sense of achievement.



### **COMPETENCIES THAT MAKE YOU UNIQUE**

What are the characteristics of Tec-educated leaders?

At Tecnológico de Monterrey, we have defined, after consulting leaders from diverse sectors and employers, seven competencies that all our students should possess. Regardless of which degree you are studying, the educational model anticipates that you will develop them through diverse challenges, courses and activities related to your university experience. They are:

- 1. Self-knowledge and management
- 2. Innovative entrepreneurship
- 3. Social intelligence
- 4. Commitment to ethics and citizenship
- 5. Reasoning for complexity
- 6. Communication
- 7. Digital transformation

These seven competencies, together the **knowledge**, **skills**, **attitudes and values related to the area of Engineering and your degree**, will be your letter of introduction and your passport in the professional world.

#### STEP-BY-STEP RECORD OF YOUR LEARNING

While you are at university, you will keep a record in your competency file of the degree of progress you have made and the supporting evidence. Taking responsibility for creating this file will, from this very moment, be extremely useful when you join the workforce.



### YOU USED TO CHOOSE A DEGREE, NOW YOU CHOOSE A PATH

Area

Your curriculum will be a non-linear educational, dynamic and flexible experience. You will enjoy **more time and more elements** to know and mature your degree choice, as well as to **discover and capitalize all the opportunities** you have to personalize your degree program.

The model is comprised of **three stages** and, from the first semester, you will experience educational units (courses and blocks) that have clearly defined, individual and collaborative project- and task-oriented competency development objectives (knowledge, skills, attitudes and values). In the "blocks", you will be tackling challenges connected to reality, working collaboratively with the support of a group of faculty who will guide your learning and, at the end, evaluate your competencies together with you and your peers.

These challenges, apart from being attractive, are comprehensive experiences, since they will drive you and your peers to observe reality, map situations, diagnose problems, reflect, dialogue and confront ideas on theories and techniques to solve these problems, while experiencing, designing and producing prototypes and solutions, within a reflective, applicative dynamic in which you can take risks and make mistakes and adjustments to achieve the objective.



Give a personal touch to your degree program through specialization within or outside your discipline.

Develop the competencies relevant to your degree through more focused courses and challenges.

Acquire the basic knowledge of your area, through courses and challenges related to degrees from the area of Engineering - Applied Sciences.

Degrees

# **ENGINEERING** A NEW GENERATION

Scientific knowledge has transformed every industry and every sector, revealing possibilities of bringing about change in the same. In medicine, it has extended life expectancy; in economics, it has helped to create new economic models; in the field of energy, it has enabled us to coexist with nature and use its resources with a minimal impact. In short, the benefits that science constantly brings to the world are innumerable.

Those who are linked to science use this fundamental knowledge to solve complex problems in natural and exact sciences, in the most diverse settings, which require a structured scientific methodology as well as experimentation and modeling using mathematical methods and technological tools.

The degrees in this track offer students an excellent preparation to pursue graduate studies in science and technology.

Engineers trained at Tec have a renewed profile and a forward-looking vision. You will find them grouped together in four tracks or lines of development: Computer Studies and Information Technologies; Innovation and Transformation; Bioengineering; and Chemical Processes and Applied Science. Each program addresses, from its own environment, society's enormous challenges, which require solutions backed by technology-based knowledge.









# The area of Applied Sciences groups together the following degrees:

- IDM B. S. in Data Science and Mathematics Engineering
- IFI B. S. in Engineering Physics
- INA B. S. in Nanotechnology Engineering



#### LEARNING THROUGH TEC WEEKS

### TEC Weeks, an intensive pause for your comprehensive growth

Every semester will be interspersed with Tec Weeks, specifically aimed at purposefully developing your competencies for life, such as social intelligence, commitment to ethics and citizenship, communication and entrepreneurship, among others. The better you know yourself, the more you will grow.



### **IDM** B.S. IN DATA SCIENCE AND MATHEMATICS ENGINEERING

# A new profession for new challenges

From a contemporary perspective,

mathematics is an enabling science. It provides a logically coherent framework and a universal language for process analysis, optimization and control. It is the science that makes it possible to extract knowledge from data in order to optimize outcomes and processes, and, at the same time, assures their integrity and security.

#### Data Science and Mathematics engineers will graduate from Tec de Monterrey with the following competencies:

- Build deterministic or stochastic mathematical models, supported by cutting-edge computer tools.
- Design linear and nonlinear optimization models for complex problems using computer tools.
- Analyze and process structured and unstructured data using mathematical methods, statistics, artificial intelligence and techniques consistent with data science.
- Use artificial intelligence and cognitive computing methods to solve optimization problems.
- Design complex mathematical models that contribute to data and computer system security.
- Communicate scientific and technological information in the area of mathematics applications to diverse audiences.





Area

# WHICH SPECIALIZATIONS ARE AVAILABLE TO YOU?

The educational model enables you to personalize your graduate profile. During the specialization stage, consider a focus based on your post-graduation plans. Tec offers you the means to achieve this through diverse concentrations.

#### **CAREER FIELD**

On graduating from Data Science and Mathematics Engineering, you will be able to work in diverse areas of an organization, such as:

- Data science: analysis, research, application
- Consulting in data analysis for decision making in companies
- Design mathematical models for data security systems
- Research centers in the areas of applied mathematics

### **IS THIS RIGHT FOR YOU?**

Do you see what everybody sees, but you analyze it and think differently? Are you passionate about mathematics? Are you interested in cutting-edge technology and its foundations? This is the degree for you. To see the latest version of the curriculum visit:









Where are these degrees offered?

# CURRICULUM CHOOSE YOUR PATH



#### What you need to know about each stage of your curriculum:

#### **Exploration**

- You will open your competency file and add to it throughout your degree program.
- 2. You will learn the foundations of the area of Engineering Applied Sciences.
- 3. You will participate in fundamental and exploration challenges from the area of Engineering - Applied Sciences, interacting with peers from different degree programs.
- 4. You will study general education courses, selecting them from a collection.
- 5. You will participate in a challenge that integrates all the competencies to be developed in this phase.

#### **Focus**

- 1. You will acquire the core competencies of your degree, in other words, those that distinguish it.
- You will participate in more focused challenges to reinforce what you have learned and broaden your basic knowledge.
- 3. You will have the elements to decide whether to deepen your knowledge or diversify and, subsequently, build your specialization plan.
- **4.**The Tec Weeks, challenges and overall university experiences will enrich your file.

#### **Specialization**

- 1. You have decided whether to diversify or delve further into your degree, by choosing a concentration, a modality, an internship stay, to mention just a few of your options. The Tec Semester is a flexible-time space to get started.
- 2. You will develop the competencies related to your specialization, increasingly connected to your passions, interests and plans.
- **3.** If you decided to opt for a concentration, on graduating you will obtain a professional concentration certificate.







# Where are these degrees offered?







- General education course
- Area exploration course
- Introductory block (CHALLENGE)
- Area exploration block (CHALLENGE)
- Optional block outside the area (CHALLENGE)
- Disciplinary course
- Disciplinary block (CHALLENGE)
- Disciplinary global block (CHALLENGE)
- Tec Semester
- Multi-disciplinary block (CHALLENGE)
- Final global block (CHALLENGE)



		SEMESTER	6			SEMESTER 7	
Use of Modern Algebras for Security and Cryptography	Tec Week	Use of Geometry and Topology for Data Science	Tec Week	Numerical Analysis for Non-Linear Optimization	Week 18	Tec Semester (Professional Elective I-VI)	Week18



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# **IFI** B.S. IN ENGINEERING PHYSICS

# Solutions are built on foundations

Physics allows us to understand how the universe and everything around us works. As an Engineering Physicist, you will use the principles and foundations of science to create scientific and technological solutions that will impact the way we live in a broad range of areas, such as optics, renewable energies, nanotechnology, among many others.

#### Engineering Physicists will graduate from Tec de Monterrey with the following competencies:

- Solve complex problems related to physical phenomena using innovative procedures.
- Build mathematical and computational models of physical systems, using the principles of fundamental science and technological resources.
- Characterize physical phenomena of fundamental and applied science by conducting experiments or making prototypes.
- Identify physical phenomena that will potentially generate opportunities for scientific and technological innovation.
- Communicate scientific and technological information in the area of physics and engineering physics to a diversity of audiences.





Area

# WHICH SPECIALIZATIONS ARE AVAILABLE TO YOU?

The educational model enables you to personalize your graduate profile. During the specialization stage, consider a focus based on your post-graduation plans. Tec offers you the means to achieve this through diverse concentrations.

#### **CAREER FIELD**

Thanks to the integral education you will receive in this degree, on graduating you will be able to work successfully in diverse areas:

- Research centers in the areas of photonics, alternative energy sources and quantum technologies.
- Area of innovation and development in technology-based companies.
- Area of technological development , providing solutions to complex problems.
- Specialized consulting firms.

### **IS THIS RIGHT FOR YOU?**

If you are passionate about research and physical sciences and constantly looking for answers to diverse natural phenomena, and also have an inquisitive spirit, you're in the right degree.

### To see the latest version of the curriculum visit:









Where are these degrees offered?

# CURRICULUM CHOOSE YOUR PATH



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	SEMESTER	6			SEMESTER 7
Experimental Characterization by Electronic Instrumentation	Experimental Characterization of Optical Systems	Tec Week	Experimental Characterization of Materials	Week 18	Tec Semester (Professional Elective I-VI)



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### INA B.S. IN NANOTECHNOLOGY ENGINEERING

#### The greatness of the diminutive

Welcome to the world of nanotechnology, where matter can be manipulated at the level of atoms or molecules to obtain materials and develop devices with high-impact applications for society. This technology is already making extraordinary progress in a wide variety of fields, such as medicine, construction, electronic devices, consumer products and energy. As a Nanotechnology Engineer, you can contribute to the development of pharmaceutical products, cosmetics, electronic devices, biomedical devices, materials, nanomaterials and innovations, with a high scientific, technological and economic impact, in order to, from the atomic and molecular scale, transform the world for the best.

#### Nanotechnology Engineers will graduate from Tec de Monterrey with the following competencies:

- Communicate scientific and technological information in the field of nanotechnology and chemistry to a wide range of audiences.
- Evaluate the most relevant physical and chemical properties that determine the performance of nanotechnological product components.
- Design chemical and physical methods in the production of a substance, nanomaterial or nanostructure with the appropriate properties for a specific application.
- Develop nanotechnological products in a specific market, applying the fundamental principles of chemistry, nanoscience and engineering.
- Solve complex problems associated with the components of a nanotechnological product, using technological tools.
- Apply scientific research methodologies in the field of chemistry and nanotechnology, with a multidisciplinary approach.





Area

# WHICH SPECIALIZATIONS ARE AVAILABLE TO YOU?

The educational model enables you to personalize your graduate profile. During the specialization stage, consider a focus based on your post-graduation plans. Tec offers you the means to achieve this through diverse concentrations.

#### **CAREER FIELD**

Thanks to the integral education you will receive in this degree, on graduating you will be able to participate in diverse areas:

- Industry and companies specializing in chemistry, electronics, materials, food, nanotechnology and pharmaceuticals, among others.
- Research centers and technology-based companies.
- Technology consulting firms

### **IS THIS RIGHT FOR YOU?**

If you are passionate about science, particularly chemistry and interested in contributing in diverse disciplines, and enjoy looking for ways to create new things that will help humanity, this is your degree.

### To see the latest version of the curriculum visit:









# CHOOSE YOUR PATH



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			SEMESTER	6		
0	Design of Nanotechnological Devices		Prototype Generation and Process Scaling		Research and Experimental Design	
	Development of Integral Solutions with Nanodevices	Tec Week	Development of Integral Prototyping and Scaling Solutions	Tec Week	Development of Integral Solutions in Research and Experimental Design	
			SEMESTER	8		

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### **ENGINEERING** APPLIED SCIENCES

With the Engineering entry, you have the option of moving throughout your undergraduate studies to the campus that offers the specialization you would like to pursue.



# UNLEASH YOUR POTENTIAL TO TRANSFORM

At Tecnológico de Monterrey we're looking for students willing to be better for the benefit of others, people with the humility and courage to challenge paradigms, with the ambition to improve, who embrace the most advanced technical knowledge, and with an ethical and humanistic profile,who dare to go forward, more willing to be than to have.

For further information on the degrees from the area of Engineering - Applied Sciences, go to



\*DEC-520912. On-site programs