Advanced Master's Degree
Intelligent Infrastructures

tech global university

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Advanced Master's Degree
Intelligent Infrastructures

- Modality: **online**
- Duration: **2 years**
- Certificate: **TECH Global University**
- Accreditation: **120 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/us/engineering/advanced-master-degree/advanced-master-degree-intelligent-infrastructures**

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01

Introduction

Technological innovations have made it possible to revolutionize urban centers with new tools that improve the quality of life of the inhabitants. Large cities, which are becoming increasingly populated, require innovation to meet the needs of their citizens. Study with us and you will be able to specialize in the latest intelligent infrastructures.

Technological developments have favored the emergence of Smart Cities, which are more sustainable and offer substantial improvements over traditional cities. In this Advanced Master's Degree, we give you the keys to constructing intelligent infrastructures, in an intensive and complete specialization"

Cities are becoming larger and more populated, so the demands of their inhabitants in terms of infrastructure are also greater. In recent years, technological developments have led to the creation of intelligent infrastructures, which has given rise to the concept of Smart Cities, highly technological cities that rely on information and communication technologies to increase their efficiency and offer intelligent infrastructures that facilitate the quality of life of their inhabitants.

In this context, civil engineering professionals play a fundamental role, as they must be able to adapt their projects to the technological benefits that allow the creation of this type of infrastructure. In addition, these have the advantage of being highly digitized, which also facilitates the rehabilitation and renovation processes, since they have a large amount of digitized analytical data that allow faster and more efficient solutions.

In this Advanced Master's Degree in Intelligent Infrastructures, we offer you a quality educational program, with a complete program aimed at professionals in this field who wish to learn about the latest technologies that can be applied to their daily work. Throughout this specialization, the student will learn all of the current approaches to the different challenges posed by their profession. An important step that will become a process of improvement, not only professionally, but also personally. Additionally, at TECH we have a social commitment: to help highly qualified professionals to specialize and to develop their personal, social and professional skills throughout the course of their studies.

This program not only takes you through the theoretical knowledge it offers, but also shows you another way of studying and learning which is more organic, simpler and more efficient. TECH works to keep you motivated and to promote a passion for learning, also encouraging you to develop critical thinking.

This Advanced Master's Degree is designed to give you access to the specific knowledge of this discipline in an intensive and practical way. A great value for any professional. Furthermore, as it is a 100% online specialization, the student decides where and when to study. Without the restrictions of fixed timetables or having to move between classrooms, this course can be combined with work and family life.

This **Advanced Master's Degree in Intelligent Infrastructures** contains the most complete and up-to-date scientific program on the market. The most important features of the program include:

- The latest technology in online teaching software
- A highly visual teaching system, supported by graphic and schematic contents that are easy to assimilate and understand
- Practical cases presented by practising experts
- State-of-the-art interactive video systems
- Teaching supported by remote learning
- Continuous updating and retraining systems
- Autonomous learning: full compatibility with other occupations
- Practical exercises for self-evaluation and learning verification
- Support groups and educational synergies: questions to the expert, debate and knowledge forums
- Communication with the teacher and individual reflection work
- Content that is accessible from any, fixed or portable device with an Internet connection
- Supplementary documentation databases are permanently available, even after the course

A high level scientific program, supported by advanced technological development and the teaching experience of the best professionals"

A program created for professionals who aspire to excellence that will allow you to acquire new skills and strategies in a smooth and effective way"

A program created for professionals who aspire to excellence, allowing them to acquire new skills and strategies in a fluid and effective manner

Our teaching staff is made up of practicing professionals. In this way, we ensure that we provide you with the up-to-date education we are aiming for. A multidisciplinary staff of trained and experienced professionals from a variety of environments, who will efficiently develop theoretical knowledge, but above all, will contribute the practical knowledge derived from their own experience to the specialist program.

This command of the subject is complemented by the effectiveness of the methodological design of this Advanced Master's Degree. Developed by a multidisciplinary team of e-learning experts, it integrates the latest advances in educational technology. In this way, you will be able to study with a range of easy-to-use and versatile multimedia tools that will give you the operability you need in your specialization.

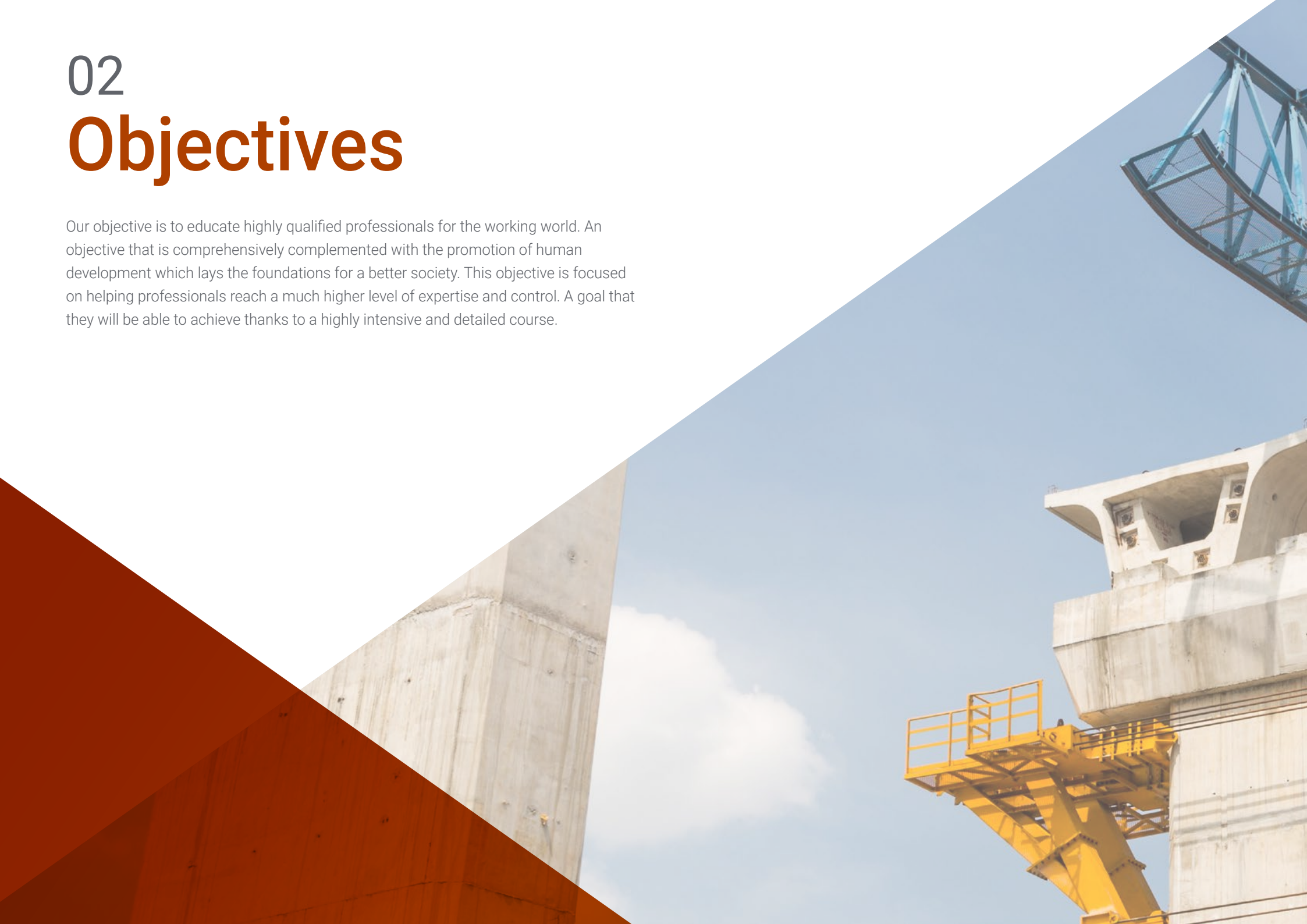
The design of this program is based on Problem-Based Learning, an approach that conceives learning as a highly practical process. To achieve this remotely, TECH will use telepractice. With the help of an innovative interactive video system, and learning from an expert, you will be able to acquire the knowledge as if you were actually dealing with the scenario you are learning about. A concept that will allow you to integrate and fix learning in a more realistic and permanent way.

A deep and comprehensive look at the most important smart infrastructure strategies and approaches

02

Objectives

Our objective is to educate highly qualified professionals for the working world. An objective that is comprehensively complemented with the promotion of human development which lays the foundations for a better society. This objective is focused on helping professionals reach a much higher level of expertise and control. A goal that they will be able to achieve thanks to a highly intensive and detailed course.



If your goal is to improve your performance in your profession, to acquire a qualification that will enable you to compete among the best, then look no further: welcome to TECH"

General Objectives

- Recognize Smart City projects as particular cases of Digitalization Projects through platforms, to know their main particularities and the state of the art of these projects in an international context
- Value the two essential elements in any Smart City project, data as the main asset and the citizen as the main motivator of such projects
- Analyze, in depth, the different technologies and models to address the digital transformation of cities and understand the advantages and opportunities that a model based on integration platforms offers
- Delve into the general architecture of Smart Cities Platforms and the applicable reference legislation, using international standards
- Identify the role that new digital technologies play in the construction of the Smart City model: LPWAN, 5G, Cloud y Edge Computing, IoT, Big Data, Artificial Intelligence
- Know in detail the functionalities of the different layers that constitute the digital platforms for cities: support, acquisition, knowledge, and interoperability layer
- Differentiate between digital government services and smart services in cities, the possibilities of integration between both worlds and the resulting new services for citizens and public administration services
- Differentiate the two types of solutions offered within the Smart Cities intelligent services layer: vertical solutions and cross-cutting solutions
- Carry out an in-depth breakdown of the main vertical solutions of application in cities: waste management, parks and gardens, parking, public transportation management, urban traffic control, environment, security and emergencies, water consumption and energy management
- Know in detail the cross-cutting solutions of the smart services layer that can be implemented in Smart Cities projects
- Delve into the difference between city management and territorial management, and identify their main challenges and lines of activity
- Acquire the necessary skills and knowledge for the design of technological solutions in the fields of tourism, home care, agriculture, ecosystemic spaces and urban service provision
- Have a global perspective of Smart Cities Projects, identifying the most useful tools in each of the project phases
- Recognize the keys to success and how to deal with the possible difficulties that a Smart City Project may present
- Identify the main trends and paradigms that will serve as leverage for the future transformation of Smart Cities
- Conceptually design plans and solutions aligned with the Sustainable Development Goals of the 2030 Agenda
- Acquire new knowledge in civil engineering and infrastructures
- Acquire new skills in terms of new technologies, latest machinery and software, knowledge of next steps and recycling
- Extrapolate this knowledge to other sectors of the industry, focusing on those fields that require more trained and qualified personnel year after year
- Process the data generated in civil engineering activities through the BIM environment, a mandatory reality for the design, construction, management and operation of infrastructures

Specific Objectives

- Delve into the evolution of Smart Cities, what have been the main changes that have led to the need to create Smart Cities and what are the challenges we face
- Understand how digital platforms work, and their different fields of action (industry, education, energy)
- Carry out an exhaustive analysis of two of the key axes in the definition of Smart Cities Projects: data as a lever and the citizen as a motivating element of the projects
- Differentiate, according to the size of impact, the Smart City, Territory and Campus Projects
- Have an overview of the status and differences in the approach to Smart Cities projects around the world
- Acquire the main knowledge to apply the methodology and tools necessary to implement a Smart City Strategic Plan and to develop the necessary tools to implement a Smart City Strategic Plan
- Analyze in depth different technologies and models to address the Smart Transformation of Cities
- Distinguish between the advantages and disadvantages of the different Smart City Models and their main applications
- Understand and conceptualize the paradigm of the Integration Platform Model, the benefits it brings and its fundamental role in the design of cities
- Understand the differences between technology models based on open source technology and licensed models
- Delve into the phases of a Global Smart Cities Project, its transformation and the generation of new value-added services as a lever for socio-economic growth

- Discuss in detail the general architecture of Smart Cities platforms and the applicable reference standards
- Identify the enabling elements of the platform that, although outside its reference architecture, are essential for its operation
- Carry out an in-depth breakdown of the support layer services and understanding of how they work and interact with the rest of the architecture
- Know in detail the functionalities of the acquisition layer and the different acquisition strategies depending on the type of data to be incorporated in the Smart City
- Know in detail the knowledge layer and the capabilities that enable Smart Cities
- Understand the importance of data modeling to make the data understandable by the platform, enabling operations to be performed on it
- Understand what types of analytics can be performed on the data and which are the most appropriate depending on the expected results
- Delve into data warehousing technology capabilities and the benefits of each one
- Know in depth the data exposure capabilities enabled by the interoperability layer, from those oriented to data exposure to those that allow the creation of applications and feed external systems
- Conduct an exhaustive analysis of the history of digital government at the international level and the different initiatives that exist to promote it
- Differentiate in a clear way the classic digital government processes and the services offered by a smart city
- Integrate e-government services in a Smart City and the benefits it brings to citizens
- Identify the so-called city services 4.0, Such as the city government scorecard and the new citizen crm
- Know in detail the Smart City services layer and distinguish between vertical solutions and cross-cutting solutions
- Identify the main areas of urban management, their competencies and their management models
- Differentiate between vertical monitoring, operation and management solutions
- Identify specific use cases in which technology contributes to streamline and make urban services more efficient
- Integration of the different urban services for a Smart City management through the knowledge of a specific area
- Differentiate the cross-cutting solutions of the intelligent services layer and distinguish between the different cross-cutting solution groups
- Delve into cross-cutting solutions that integrate new ways of communication with the citizen or with the elements of the city
- Know in detail the cross-cutting solutions that focus on the improvement of cross-cutting areas of the city such as mobility, urban planning and social policies
- Know in depth the cross-cutting solutions that focus on the availability of information, to different stakeholders of the city, the citizen, the municipal managers, the study and research centers and the business and economic network
- Learn about internal and external city objects, how they generate data and how they are integrated within a Smart City and new urban planning systems by analyzing vulnerabilities and strengths and integrating all Smart City information systems
- Differentiate between city management and territorial management, as well as identifying their main challenges and lines of activity
- Understand the urban vertical service delivery model through a multi-entity platform model available to different administrative groupings
- Analyze the degree of maturity of a tourist destination and design an integral solution through the combination of different market technologies
- Propose advanced use cases of recurrent presential services through new digital channels that favor the integrated aging of society

- Design territorial resilience models to strengthen its structure and improve its mechanisms for anticipating and recovering from any type of impact
- Identify the existing ecosystem of actors in the cities and the need for their integration in Smart Cities projects
- Delve into the different sources of financing for Smart Cities projects, from the most classic to the public-private partnership (ppp) models
- Perform a comprehensive analysis of the most useful tools in the implementation of Smart Cities projects at different stages of the project
- Recognize the keys to success and how to deal with the possible difficulties that a Smart City project may present
- Know the stages of engineering project development
- Know in detail the latest it tools available in the market for the optimization of resources for project writing
- Study the current regulatory framework
- Know the tools for the realization of project pre-designs in order to determine solutions with potential clients
- Acquire the skills for the analysis and use of documents provided by other companies for the drafting of the project
- Approach to the latest technologies for the collection of field data necessary for the drafting of the project
- Understand the BIM environment for project drafting
- Analyze the types of existing contracts in the civil engineering world
- Gain knowledge of the analysis of the solvency of each company
- Acquire skills for the elaboration of technical and economic offers
- Study the use of the most appropriate software for the preparation of bids
- Delve into the figure of the contract manager
- Prepare the necessary processes for the administrative start-up of a construction site and the latest developments in this regard
- Know the documents in the field of health and safety, environmental measures and waste management necessary for the development of the work
- Have the necessary knowledge for the correct implementation of the auxiliary site installations
- Be familiar with the internationalization of the company in which the student works
- Learn the current regulations in the field of health and safety
- Have the necessary guidelines for the drafting and management of the necessary health and safety documents: ESS and MSS
- Have an overview of those involved in the health and safety organigram of the worksite
- Learn about the documentation that will be generated at the construction site
- Develop the latest tools available for documentation management
- Learn about site operations in order to take the necessary actions to ensure the safety of workers and their health
- Develop the PACMA document
- Elaborate the test plan
- Perform waste management during the execution of the work
- Develop knowledge of the latest machinery available for the execution of earthworks
- Teach the student in earthworks construction processes for linear works
- Learn about the necessary analysis, prior to the beginning of the works, in terms of hydrology and hydraulics to optimize the drainage of the work
- Learn about the analysis of the existing geotechnics for the optimization of the existing foundations
- Analyze the different types of structures that exist in linear works such as underpasses, overpasses and viaducts

- Have knowledge about the necessary signaling for the execution of the linear work
- Develop the type of signaling installed in different types of railway projects (ERTMS)
- Learn about the track devices available on the market
- Teach the student about the environmental legislation in force in order to undertake a linear work
- Learn about the wide range of hydraulic works in the field of civil engineering
- Know the appropriate machinery and construction processes for gravity and pressure pipeline works
- Approach to the special parts existing in the market for application in pipeline works
- Learn about the peculiarities, adequate machinery and construction processes of canals and dams
- Know the peculiarities, adequate machinery and construction processes of channeling works
- Know the peculiarities, suitable machinery and construction processes of WWTP, DWTP and irrigation works
- Knowledge of maritime climate theory
- Execute works in ports
- Make vertical dikes
- Make breakwater dikes
- Know the beach dynamics
- Know the beach balance profiles
- Execute works on the coast
- Learn about the dredging sector
- Gain knowledge of the machinery and construction processes in the dredging sector
- Develop understanding of issues related to the particularities of the execution of airport works from a technical and airport operations point of view
- Approach the development of works in the industrial and renewable energy sectors
- Present the latest trends in the field of R&D&I
- Learn about the industrialization sector of the civil works sector
- Know the figure of the project management professional
- Learn about project management from the time, organization, economic and human resources perspectives
- Have the necessary training to improve the professional's communication with customers and suppliers
- Acquire the skills for the correct purchasing management
- Have the analytical capacity to optimize results in the development of each project
- Know the appropriate software tools for the planning, follow-up and closure of works.
- Prepare the necessary documentation for the preparation of the settlement and closing of the work
- Learn how to carry out the general measurements of the work
- Know the latest tools available to perform field measurements
- Develop knowledge of the methods for closing nonconformities opened during the course of the work
- Detect and create conflicting prices
- Learn about negotiation for the discussion with the client for the economic closing of the work
- Monitor and open additional files to that of the work itself, such as the price revision
- Carry out an in-depth study of maintenance and conservation contracts
- Draft bids for maintenance and conservation contracts, both from a technical and economic point of view
- Learn how to carry out maintenance tasks

- Coordinate human and machinery teams for the optimal development of the conservation and maintenance contract
- Know the ins and outs of road, rail and port conservation and maintenance
- Have the guidelines for the economic management of the contract
- Delve into the specific machinery for maintenance and conservation tasks on roads and railways
- Know the infrastructure repair sector
- Know the necessary guidelines for the realization of inventories of infrastructures susceptible to repair, applying the latest technologies such as drones for the analysis of infrastructures
- Know which are the new informatics tools for the decision-making process of action in some infrastructures or others
- Study the pathologies that can be found in bridges and tunnels
- Learn about infrastructure fault monitoring both from the point of view of data collection in the field and from the point of view of data processing
- Know the methods for the execution of the repair work itself
- Carry out a review of the equipment necessary to perform this type of repair work
- Identify the state of maturity and level of service transformation in the cities
- Understand the value of data and the importance of establishing a data governance strategy through a public management entity
- Analyze different city management models from the generation of an ecosystem of solutions and use cases from the combination of multiple sectorial platforms
- Define new use cases that help cities become more agile, flexible and resilient to chronic stresses or acute shocks that may weaken their structure
- Conceptually design plans and solutions aligned with the Sustainable Development Goals of the 2030 Agenda

Our objective is very simple: to offer you quality specialized education, with the best teaching methods currently, so that you can reach new heights of excellence in your profession"

03

Skills

Once all the contents have been studied and the objectives of the Advanced Master's Degree in Intelligent Infrastructures have been achieved, the professional will have superior competence and performance in this area. A very complete approach, in a high-level Advanced Master's Degree, which makes the difference.

Achieving excellence in any profession requires effort and perseverance. But above all, the support of professionals who will give you the boost you need, with the necessary means and assistance. At TECH, we offer you everything you need"

General Skills

- Know in depth, both at a theoretical and practical level, the technological status and the particularities of Smart Cities projects at an international level
- Have an innovative vision of the future of Smart Cities, delving into new models of planning, design and creation of them
- Participate in, or direct, all the activities present throughout the different phases, from the location of contracts and preparation of offers for bidding and awarding, to the operation during their execution and closing, using the latest technologies and the most innovative techniques currently available in the market
- Identify and repair infrastructures using novel methods
- Adapt civil infrastructures to new national and international regulations
- Design and manage the application of new technologies to civil infrastructure management, designing and implementing computerized and automated control systems

Specific Skills

- Identify the main changes that have taken place in large cities linked to technological development
- Know the advantages of smart cities and apply the necessary tools to participate in the process of change in these cities
- Identify and develop the capabilities and the general architecture that a digital city platform must have
- Perform the necessary analysis on the data of the smart cities digitalplatforms, thanks to the layers of knowledge and interoperability of the platforms
- Integrate digital government systems into *smart cities* to achieve more beneficial outcomes for citizens
- Apply new technologies to develop intelligent services that favor the quality of life of citizens, such as services for waste management, environment, air quality, parks and gardens, energy efficiency and public lighting, among others
- Develop intelligent solutions for mobility management, urban planning or social policies.
- Create digital solutions that ensure personal, home, digital, financial and social well-being.
- Identify the main sources of financing for smart cities projects and which are the most useful tools for their development
- Perform the drafting of construction projects with the use of the latest it tools
- Apply all the latest knowledge and techniques for the realization of contracts, being all the relevant administrative processes
- Apply health and safety regulations at all stages of project design and construction
- Develop linear works following the current regulations and choosing the specific and most adequate machinery for each case
- Apply all the necessary tools for the construction of hydraulic works
- Develop maritime works taking into account the peculiarities of each construction and taking into account the latest trends in R&D&I
- Perform budget, cost, purchasing, planning and certification control of a project
- Perform the necessary tasks for the project completion (settlement and closing of the work), as well as its montoring
- Perform conservation and maintenance contracts
- Identify and repair possible damage to infrastructure
- Gain in-depth knowledge of the future of smart cities and know how to identify the benefits of new technologies applied to smart infrastructures

Improving your skills in the field of intelligent infrastructures will allow you to be more competitive. Continue your specialization and give your career a boost"

04

Course Management

For our Advanced Master's Degree to be of the highest quality, we are proud to work with a teaching staff of the highest level, chosen for their proven track record in the field of education. Professionals from different areas and fields of expertise that make up a complete, multidisciplinary team. A unique opportunity to learn from the best.

Our professors contribute their vast experience and their teaching skills to offer you a stimulating and creative specialized program"

Management

Mr. Uriarte Alonso, Mario

- Civil Engineer from the University of Cantabria
- Master's Degree in Oceanographic Engineering
- 17 years of experience in the field of construction execution, having worked as construction manager in several projects such as highways, airports, ports, canals, railways and hydroelectric works
- In the field of engineering, he is the CEO of Candois Ingenieros Consultores SL, a company dedicated to the drafting of projects and construction management

Mr. Torres Torres, Julián

- Civil Engineer from the University of Granada
- Master's Degree in Structures
- 14 years of experience in the field of construction execution, having worked as construction manager in road, urbanization and WWTP works
- In the engineering field he has developed his work as an independent freelance and as technical director at Candois Ingenieros Consultores SL

Mr. Garibi, Pedro

- Technical Electronic Engineer from the University of Deusto
- Telecommunications Engineer from the University of Deusto
- Master's Degree in Mobile Communication from the Polytechnic University of Madrid
- Professional with more than 20 years of experience in project management
- Solutions architect in the fields of Smart & Safe Cities for more than 12 years in different companies (Indra, Huawei, T-Systems)
- Director of Smart Cities projects for more than 8 years, both in the R&D and production areas
- Independent Smart Cities Consultant

Professors

Mr. Gámiz Ruíz, Juan José

- Civil Engineer from the University of Granada
- Master's Degree in Structural Analysis and Calculation
- 12 years of experience in the engineering field providing services for the administration and developing engineering works as an independent freelance in projects and construction management

Mr. Gómez Martín, Carlos

- Civil Engineer
- BIM Master's Degree in Civil Engineering
- 13 years of experience in the field of construction execution, performing airport and industrial works
- Carries out specialized work with the BIM environment

Mr. López Puerta, Miguel Ángel

- Civil Engineer
- Master's Degree in Structural Analysis and Calculation
- 2 years of experience in the field of engineering specialized in the drafting of projects

Mr. Ruíz Megía, Alejandro

- Civil Engineer from the Alfonso X El Sabio University of Madrid
- Master's Degree in Occupational Risk Prevention
- 15 years of experience in the field of construction execution, having worked as construction manager in highway works, urbanizations, coastal and port works, airports and singular construction

Mrs. Domínguez, Fátima

- Degree in Civil Engineering from the Polytechnic University of Leiria (Portugal)
- ThePowerMba Business Expert - Business Management and Administration
- Consultant and area manager of Business Development for Public Administrations in the field of Smart Cities (Indra-Minsait)
- Responsible for the Caceres Smart Heritage Project
- Product owner of solutions for the intelligent management of tourist destinations
- Expert in smart solutions in the fields of agribusiness, urban services and tourism destination management

Mr. Koop, Sergio

- Degree in Industrial Technologies Engineering from Carlos III University of Madrid
- Master's Degree in Business Management from Carlos III University of Madrid
- More than 4 years of experience as a Smart Cities consultant (Indra - Minsait)
- Expert in smart solutions in the fields of urban resilience, mobility, urban services and tourism destination management
- Author of several reports focused on the use of disruptive technologies for the transformation of public administrations
- Collaborator of the S3 HIGH TECHFARMING group of the EU for the development of technologies to improve agricultural productivity

Mr. Budel, Richard

- Diploma in Medical Anthropology from Trent University (Canada)
- Professional with more than 25 years of experience in project management in the public sector, both on the business and client side
- Managing Director of Simplicities Ltd
- Managing Partner of the Public Sector Department at Sullivan & Stanley
- Chairman of the Digital Government Advisory Board at Huawei
- Former Chief Information Officer (CIO/CTO) at IBM and Huawei
- Former IT Director, Department of Public Safety and Justice, Government of Ontario, Canada
- Thought leader and speaker at events in more than 70 countries around the world
- Collaborator in UN4SSC, EIP-SCC, Smart Cities Council and other multinational organizations

05

Structure and Content

The contents of this specialization have been developed by different professors with a clear purpose: to ensure that students acquire each and every one of the skills necessary to become true experts in this field. The content of this course enables you to learn all aspects of the different disciplines involved in this field. A complete and well-structured program that will take you to the highest standards of quality and success.

Through a very well compartmentalized development, you will be able to access the most advanced knowledge of the moment in intelligent infrastructures"

Module 1. The Smart Cities Paradigm

1.1. The Smart City
- 1.1.1. Evolution of Smart Cities
- 1.1.2. Global Changes and New Challenges

1.2. Digital Platforms
- 1.2.1. Big Data and IoT
- 1.2.2. Origin, Present and Future of Platforms

1.3. Use Cases of Digital Platforms
- 1.3.1. Niche Platform
- 1.3.2. Platforms Platform

1.4. Smart Cities: a Digital Platform Use Case
- 1.4.1. New Challenges in the Cities of the 21st Century - The Functional City
- 1.4.2. Technology as an Essential Part of the Solution to the Challenges

1.5. The Citizen at the Center of the Smart City
- 1.5.1. Objective of Smart Cities
- 1.5.2. Smart Cities at the Service of the Citizen

1.6. From Data to Information and from Information to Knowledge
- 1.6.1. The City: The Largest Data Repository
- 1.6.2. Smart Cities as a Tool for Information Exploitation

1.7. Smart Cities, an Example of Global Work
- 1.7.1. Cities: a Complex Environment with Many Actors
- 1.7.2. Shared Management Model in the Cities

1.8. From Smart Cities to Smart Territories
- 1.8.1. Territorial Challenges
- 1.8.2. Solution to the Challenges of the Territory

1.9. From Smart Cities to Smart Campus
- 1.9.1. Campus Challenges
- 1.9.2. Solution to the Challenges of the Campus

1.10. Smart Cities in the World
- 1.10.1. Technological Maturity
- 1.10.2. Geography of Smart Cities Projects

Module 2. Smart Cities Construction Models

2.1. Different Models to Build a Smart City
- 2.1.1. Different Smart Cities Models
- 2.1.2. Greenfield and Brownfield

2.2. Smart Cities Strategy
- 2.2.1. Master Plans
- 2.2.2. Monitoring and Implementation: Indicators

2.3. Models Based on IoT Collections and Vertical Solutions
- 2.3.1. Models Based on IoT Collections
- 2.3.2. Models Based on Vertical Solutions

2.4. Models Based on GIS Systems
- 2.4.1. Spatial Data and GIS Tool for the Management and Analysis of Geographical Information
- 2.4.2. Geospatial Analysis

2.5. Models Based on VMS
- 2.5.1. Main Features of VMS Systems
- 2.5.2. VMS Systems for Traffic Control, Mobility and Urban Safety

2.6. Models Based on Integration Platforms
- 2.6.1. The Value of an Integrating Vision
- 2.6.2. City Semantics

2.7. Platform Features and Standards
- 2.7.1. Characteristics of Smart Cities Platforms
- 2.7.2. Normalization, Standardization and Interoperability

2.8. Security in Smart City Platforms
- 2.8.1. Cities and Critical Infrastructure
- 2.8.2. Security and Data

2.9. Open Source and Licensing
- 2.9.1. Open Source or Licensed Platforms
- 2.9.2. Solutions and Services Ecosystems

2.10. Smart Cities as a Service or as a Project
- 2.10.1. The Integral Smart Cities Project: Consultancy, Products and Technical Office
- 2.10.2. Smart Services as a Lever for Growth

Module 3. Smart City Platforms: General Architecture and Acquisition Layer

3.1. The General Platform Model
- 3.1.1. Platform Layer Model
- 3.1.2. Reference Standards and Recommendations Applicable at the National and International Levels

3.2. Architecture
- 3.2.1. Platform Architecture
- 3.2.2. Block Description

3.3. Enabling Tools
- 3.3.1. Communication Networks
- 3.3.2. *Cloud Computing* and *Edge Computing*

3.4. Support Layer
- 3.4.1. Support Layer Services
- 3.4.2. Configuration Services
- 3.4.3. User Management Services
- 3.4.4. Supervision and Maintenance Services
- 3.4.5. Security Services

3.5. Acquisition Layer
- 3.5.1. Acquisition Layer Object
- 3.5.2. Integration of the Acquisition Layer Within the Model
- 3.5.3. Acquisition Layer Main Features

3.6. Technologies Used for Acquisition
- 3.6.1. Main Data Acquisition Technologies
- 3.6.2. Use of Acquisition Technologies

3.7. IoT Data Acquisition
- 3.7.1. IoT Data
- 3.7.2. Device Data Integration
- 3.7.3. Data Integration from IoT Platforms
- 3.7.4. Digital Twin in IoT Management

3.8. Data Acquisition from Existing Systems
  3.8.1. Integration of Existing Systems
  3.8.2. The Smart City Platform as a Platform of Platforms
  3.8.3. Platforms Data Integration
3.9. Repository Data Acquisition
  3.9.1. Information in Databases
  3.9.2. Data Integration from Databases
  3.9.3. How to Manage Information Duplicity
3.10. Unstructured Data Acquisition
  3.10.1. Unstructured Data
  3.10.2. Sources of Unstructured Information
  3.10.3. Unstructured Information Acquisitionh

Module 4. Smart City Platforms: Knowledge Layer and Interoperability Layer

4.1. Knowledge Layer
  4.1.1. Knowledge Layer Object
  4.1.2. Integration of the Knowledge Layer Within the Model
  4.1.3. Knowledge Layer Main Features
4.2. The Data Modeling
  4.2.1. Data Modeling
  4.2.2. Data Modeling Technologies and Strategies
4.3. Rule-Based and Process-Based Processing
  4.3.1. Rule-Based Modeling
  4.3.2. Process Based Modeling (PBM)
4.4. Processing Big Data
  4.4.1. Big Data
  4.4.2. Descriptive, Predictive and Prescriptive Analytics
  4.4.3. Artificial Intelligence and Machine Learning in Cities
4.5. Analytical Collaboration Tools
  4.5.1. Integration of Collaborative Data Analytics Tools
  4.5.2. Main Collaborative Tools
  4.5.3. Benefits of Using Collaborative Analytics Tools
4.6. Data Bases
  4.6.1. The Different Databases and Their Application
  4.6.2. Relational Databases
  4.6.3. Non-Relational Databases
  4.6.4. GIS Databases
4.7. Interoperability Layer
  4.7.1. Interoperability Layer Object
  4.7.2. Integration of the Interoperability Layer Within the Model
  4.7.3. Interoperability Layer Main Features
4.8. Graphical Data Display Tools
  4.8.1. The Importance of Data Presentation
  4.8.2. Integrated Graphics Tools vs. External Tools
4.9. Integration Enabling Tools
  4.9.1. Simple and Reliable Data Exposure
  4.9.2. API Managers
4.10. SDK-Based Development Tools
  4.10.1. Software Development Tools
  4.10.2. SDK Sandboxes

Module 5. The Smart City and Digital Government

5.1. Difference Between Digital Government and Smart City
  5.1.1. Digital Government
  5.1.2. Main Difference Between Digital Government and Smart City
  5.1.3. The Integration of Digital Government in the Smart City
5.2. Classic Digital Government Solutions
  5.2.1. Accounting Solutions
  5.2.2. Tax and Collection Solutions
  5.2.3. Document Management Solutions
  5.2.4. Population Management Solutions
  5.2.5. Records Management Solutions
5.3. Asset Management in the City
  5.3.1. Asset Management System
  5.3.2. Importance of Asset Management in the City

5.4. The Electronic Headquarters
- 5.4.1. Electronic Headquarters
- 5.4.2. Citizen's Folder

5.5. Integration of the Elements of Digital Government in Smart Cities
- 5.5.1. Objective of Digital Government Integration - Smart City
- 5.5.2. Difficulties in Integration
- 5.5.3. Steps to Consider in Integration

5.6. The Smart City, as a Tool for Improving Digital Government Processes
- 5.6.1. Ease of Integration of New Services
- 5.6.2. Optimization of Management Processes
- 5.6.3. Improving Internal Knowledge

5.7. Services 4.0
- 5.7.1. Services 4.0
- 5.7.2. Citizen Participation Systems

5.8. Knowledge Management
- 5.8.1. Data Technology at the Service of City Data
- 5.8.2. The Transparency Portal
- 5.8.3. The City Scorecard

5.9. Analytical Systems
- 5.9.1. City Data Analytics on a New Level
- 5.9.2. Fraud Detection Systems

5.10. Customer Relationship Management (CRM)
- 5.10.1. Citizen CRM
- 5.10.2. New Citizen Service Systems

Module 6. Vertical Solutions for Urban Services Management

6.1. Importance of Municipal Areas
- 6.1.1. Organizational Model of Cities and Municipalities
- 6.1.2. Coordination and Management of Municipal Areas

6.2. Waste Management
- 6.2.1. Challenges to be Solved in Waste Management
- 6.2.2. Technologies Involved in its Resolution

6.3. Environmental and Air Quality Management
- 6.3.1. Challenges to be Solved in Environmental Management
- 6.3.2. Air Quality
- 6.3.3. Proactive Citizen Communication Alerts

6.4. Urban Traffic Control
- 6.4.1. Challenges to be Solved in Urban Traffic Control
- 6.4.2. Technologies Involved in its Resolution

6.5. Parking Management
- 6.5.1. Challenges to be Solved in Parking Management
- 6.5.2. Technologies Involved in its Resolution

6.6. Public Mobility Management
- 6.6.1. Challenges to be Solved in Public Mobility
- 6.6.2. Technologies Involved in its Resolution

6.7. Security and Emergencies Area
- 6.7.1. Challenges to be Solved in Security and Emergencies Management
- 6.7.2. Technologies Involved in its Resolution

6.8. Energy Management Area
- 6.8.1. Challenges to be Solved in Energy Management
- 6.8.2. Street Lighting

6.9. Parks and Gardens Management Area
- 6.9.1. Challenges to be Solved in Parks and Gardens Management
- 6.9.2. Technologies Involved in its Resolution

6.10. Water Consumption Management
- 6.10.1. Challenges to be Solved in Water Consumption Management
- 6.10.2. Monitoring of Water Supply and Sanitation Network

Module 7. Smart Cities Cross-Cutting Solutions

7.1. Cross-Cutting Solutions
- 7.1.1. Importance of Cross-Cutting Solutions
- 7.1.2. Smart Cities as a Guarantor of the Operation of Cross-Cutting Solutions

7.2. Citizen Card Solutions
- 7.2.1. Citizen Card
- 7.2.2. Solutions for the Integration of the Citizen Card in City Services

7.3. Internal and External City Objects
- 7.3.1. Internal City Objects
- 7.3.2. External City Objects
- 7.3.3. Integration of the Information of City Objects in the Smart City

7.4. Citizen Mobility Solutions
- 7.4.1. Mobility Beyond Private and Public Transportation
- 7.4.2. Mobility Management in the Smart City

7.5. New Urban Planning Systems
- 7.5.1. Functional Centrality Index
- 7.5.2. Analysis of Vulnerabilities and Strengths
- 7.5.3. Integration of Planning Systems in the Smart City

7.6. Inclusive Social Policy Planning
- 7.6.1. Complexity of Social Policies
- 7.6.2. The Use of Data for the Articulation of Social Policies
- 7.6.3. The Use of the Smart City for the Application of Social Policies

7.7. Empowering Innovation and the Local Ecosystem
- 7.7.1. The City Lab
- 7.7.2. The Creation of a Diverse Innovation Network
- 7.7.3. University-Business Collaboration

7.8. Open Data Portals and Marketplaces
- 7.8.1. Data Portals and their Importance in the Creation of the City Ecosystem
- 7.8.2. Open Data Portals
- 7.8.3. Marketplaces

7.9. The Citizen Portal and Citizen PPPs
- 7.9.1. Citizen Access to City Metrics
- 7.9.2. Citizen Portal Features
- 7.9.3. Features of the Citizen PPP

7.10. IOC: Holistic City Management
- 7.10.1. Holistic City Management Systems
- 7.10.2. Real-Time Operation and Supervision
- 7.10.3. Operation and Supervision in the Medium and Long Term

Module 8. From Smart City to Smart Territory

8.1. The Intelligent Territory
- 8.1.1. The Territory Challenge
- 8.1.2. The Main Axes of the Territory

8.2. Urban Vertical Services in the Territory
- 8.2.2. The Multi-Entity Platform Model
- 8.2.3. Main Vertical Services

8.3. The Smart Tourism Destination
- 8.3.1. Value Proposition
- 8.3.2. Smart Tourism Destination Strategy
- 8.3.3. Solutions and Use Cases

8.4. Agri-Food Intelligence Platform
- 8.4.1. The Challenge and the Role of Public Administrations
- 8.4.2. Solutions and Use Cases

8.5. Recurrent On-Site Services in Homes
- 8.5.1. Digital Welfare Home
- 8.5.2. Senior Contextualization, Digital Interaction and On-Site Action

8.6. Entrepreneurship, New Business Models and Economic Sustainability
- 8.6.1. The Value of Open Data in the Territory
- 8.6.2. Digital Innovation Hubs

8.7. Spatial Distribution of the Population in the Territory
- 8.7.1. Study Variables: Mobility, Economic Activity and Census
- 8.7.2. Big Data Technology for Population Analysis of the Territory

8.8. The Territorial Resilience Model
- 8.8.1. Territory Resilience Strategy
- 8.8.2. Main Solutions and Use Cases for Resilience

8.9. Intelligent Management of Adverse Weather Phenomena
- 8.9.1. Automatic Anticipation, Prevention and Preparedness Techniques
- 8.9.2. Specific Applications

8.10. Climate Change, Sustainability and Management of Natural Areas
- 8.10.1. The Climate Change Challenge
- 8.10.2. Solutions for CO2 Emission Mitigation
- 8.10.3. Territorial Vulnerability Reduction Solutions

Module 9. Smart Cities Projects

9.1. The Public Sector in Different Countries
- 9.1.1. Public Sector Particularities
- 9.1.2. Working with the Public Sector

9.2. Relevant Actors in the Cities
- 9.2.1. The Managing Entity and the Indicators
- 9.2.2. The Digital Transformation of Contractors and Service Providers

9.3. Cooperation Between the Public and Private Sectors
- 9.3.1. From the Traditional Model to the PPP Model
- 9.3.2. Project Collaboration Stages

9.4. Sources of Financing for Smart Cities Projects
- 9.4.1. Cities Own Sources of Financing
- 9.4.2. External Financing Sources
- 9.4.3. Self-Financed Projects

9.5. Pre-Project Execution Stage
- 9.5.1. Collaborative Work Tools
- 9.5.2. Co-Creation and Design Thinking

9.6. Project Execution Stage
- 9.6.1. Global Governance Model
- 9.6.2. Attributions and Success Factors in Governance: Public Party
- 9.6.3. Attributions and Success Factors in Governance: Private Party

9.7. Post-Project Execution Stage
- 9.7.1. Models of Maintenance for Smart Cities Projects
- 9.7.2. Technical Operations Office

9.8. Complexity in Smart Cities Projects
- 9.8.1. The Search for a Purpose
- 9.8.2. IT Leadership
- 9.8.3. Financing

9.9. Success Factors in Smart Cities
- 9.9.1. Leadership
- 9.9.2. Citizen at the Center
- 9.9.3. The Team
- 9.9.4. The Results
- 9.9.5. Partner Strategy

9.10. The MVP as an Element of Progress
- 9.10.1. Minimum Viable Product
- 9.10.2. From MVP to MVS

Module 10. Design and Engineering

10.1. Stages in the Design and Engineering of a Project
- 10.1.1. Problem Analysis
- 10.1.2. Solution Design
- 10.1.3. Analysis of the Regulatory Framework
- 10.1.4. Solution Engineering and Writing

10.2. Knowledge of the Problem
- 10.2.1. Coordination with the Client
- 10.2.2. Study of the Physical Environment
- 10.2.3. Social Environment Analysis
- 10.2.4. Economic Environment Analysis
- 10.2.5. Environmental Setting Analysis (EIS)

10.3. Solution Design
- 10.3.1. Conceptual Design
- 10.3.2. Alternatives Study
- 10.3.3. Pre-Engineering
- 10.3.4. Preliminary Economic Analysis
- 10.3.5. Design Coordination with the Client (Cost-Sale)

10.4. Customer Coordination
- 10.4.1. Land Ownership Study
- 10.4.2. Economic Feasibility Study of the Project
- 10.4.3. Environmental Feasibility Analysis of the Project

10.5. Regulatory Framework
- 10.5.1. General Regulations
- 10.5.2. Structural Design Regulations
- 10.5.3. Environmental Regulations
- 10.5.4. Water Regulations

10.6. Pre-Start-up Engineering
- 10.6.1. Site or Layout Study
- 10.6.2. Study of Typologies to be Used
- 10.6.3. Pre-Packaging Study of the Solution
- 10.6.4. Realization of the Project Model
- 10.6.5. Adjusted Economic Analysis of the Project

10.7. Analysis of the Tools to be Used
- 10.7.1. Team Personnel in Charge of the Work
- 10.7.2. Equipment Material Required
- 10.7.3. Software Required for Project Writing
- 10.7.4. Subcontracting Required for the Drafting of the Project

10.8. Field Work Topography and Geotechnics
- 10.8.1. Determination of the Necessary Topography Works
- 10.8.2. Determination of the Necessary Geotechnical Works
- 10.8.3. Subcontracting Topography and Geotechnical Works
- 10.8.4. Monitoring Topography and Geotechnical Works
- 10.8.5. Analysis of Results of Topography and Geotechnical works

10.9. Drafting of the Project
- 10.9.1. DIA Drafting
- 10.9.2. Drafting and Calculation Solution Geometric Definition (I)
- 10.9.3. Drafting and Calculation Solution Structural Calculation (II)
- 10.9.4. Drafting and Calculation Solution Adjustment Phase (III)
- 10.9.5. Drafting Annexes
- 10.9.6. Drawing Plans
- 10.9.7. Project Specifications Drafting
- 10.9.8. Budget Preparation

10.10. BIM Model Implementation in Projects
- 10.10.1. BIM Model Concept
- 10.10.2. BIM Model Phases
- 10.10.3. Importance of the BIM Model
- 10.10.4. Necessity of the BIM Model for Project Internationalization

Module 11. Contracting and Preliminary Work Phases

11.1. Choice of Type of Contracts to Bid and Location of Contracts
- 11.1.1. Identification of Contracting Objectives
- 11.1.2. Contracting Platforms
- 11.1.3. Customer Knowledge and Analysis
- 11.1.4. Financial Solvency Analysis
- 11.1.5. Technical Solvency Analysis
- 11.1.6. Choice of Contracts to Bid

11.2. Requirement Solvency Analysis
- 11.2.1. Financial Solvency Analysis
- 11.2.2. Technical Solvency Analysis
- 11.2.3. Joint Venture Partner Needs Analysis
- 11.2.4. Joint Venture Partner Training Negotiation

11.3. Preparation of Economic Offer
- 11.3.1. Project Budget Breakdown
- 11.3.2. Request for Study Offers
- 11.3.3. Hypothesis Statement
- 11.3.4. Closing Economic Offer/Risk

11.4. Technical Bid Writing
- 11.4.1. Study of Bidding Documents and Base Bidding Project
- 11.4.2. Technical Report Writing
- 11.4.3. Drafting of the Work Program
- 11.4.4. SYS and PACMA Documents
- 11.4.5. Improvements

11.5. Contract Analysis (Contract Manager)
- 11.5.1. Contract Manager Figure
- 11.5.2. Contract Manager Opportunities
- 11.5.3. Contract Manager Training

11.6. PSS Drafting and Opening of Work Center
- 11.6.1. PSS Drafting
- 11.6.2. PSS Approval and Opening of the Work Center
- 11.6.3. Accident Book

11.7. Drafting of the PACMA and the Waste Management Plan
- 11.7.1. Project Environmental Documentation Analysis
- 11.7.2. Analysis of the Environmental Characteristics of the Area of Operation
- 11.7.3. Knowledge of Current Environmental Legislation
- 11.7.4. Adequacy of the Company's PACMA to the Project
- 11.7.5. Elaboration of the CDW Management Plan

11.8. Site Facilities, Logistics, Stakeout of Works
- 11.8.1. Needs Analysis for Storage Areas and Facilities
- 11.8.2. Study of Materials and Facilities Required for the Implantation Area
- 11.8.3. Implementation
- 11.8.4. Topographic Survey of the Work
- 11.8.5. Drones and Topography
- 11.8.6. Topographic Data Cabinet Verification
- 11.8.7. Signing of the Stakeout Deed

11.9. Multilateral International Bids
- 11.9.1. Multilateral Organizations
- 11.9.2. Advantages of Multilateral Bidding
- 11.9.3. Search for Opportunities in the Multilateral Market
- 11.9.4. Implementation in Preparation for the Multilateral Bidding Process
  - 11.9.4.1. Countries of Interest
  - 11.9.4.2. Regulatory Framework
  - 11.9.4.3. Local Partner
  - 11.9.4.4. Technical and Economic Solvency for Internationalization
  - 11.9.4.5. International Contract Development
  - 11.9.4.6. Risks of the Internationalization of the Company

11.10. Internationalization of the Company
- 11.10.1. Countries of Interest
- 11.10.2. Regulatory Framework
- 11.10.3. Local Partner
- 11.10.4. Technical and Economic Solvency for Internationalization
- 11.10.5. International Contract Development
- 11.10.6. Risks of the Internationalization of the Company

Module 12. Health and Safety and PACMA

12.1. Health and Safety Application Standard
- 12.1.1. National Regulations
- 12.1.2. International Regulations
- 12.1.3. Implications and Responsibilities of the Interveners in the Health and Safety of the Project

12.2. Study of Health and Safety and Health and Safety Plan
- 12.2.1. Health and Safety Study
- 12.2.2. Health and Safety Plan
- 12.2.3. Drafting Phases of Both Documents
- 12.2.4. Involvement and Responsibilities of Health and Safety Study and Health and Safety Plan Authors

12.3. Figures Within the Work Organization Chart
- 12.3.1. Health and Safety Coordinator
- 12.3.2. Preventive Resources of the Company
- 12.3.3. Prevention Service
- 12.3.4. Workers

12.4. Required Documentation
- 12.4.1. Documentation Prior to Beginning of the Projects
- 12.4.2. Documentation Related to Workers
- 12.4.3. Machinery Documentation
- 12.4.4. Company Documentation

12.5. Installations, Individual and Collective Protections
- 12.5.1. Site Facilities
- 12.5.2. Individual Protection
- 12.5.3. Collective Protection

12.6. PACMA
- 12.6.1. PACMA Definition
- 12.6.2. PACMA Drafting
- 12.6.3. PACMA On-Site Monitoring
- 12.6.4. External and Internal Audits
- 12.6.5. PACMA's Added Value On-Site

12.7. On-Site Testing Control
- 12.7.1. Test Plan
- 12.7.2. Test Plan Planning
- 12.7.3. Figures in Charge of Monitoring the Test Plan
- 12.7.4. Importance of the In-Site Testing Plan

12.8 PACMA Documentation Generated at Construction Site
- 12.8.1. PACMA Documentation
- 12.8.2. Environmental Documentation
- 12.8.3. New PACMA Control Tools
- 12.8.4. Participants in the Monitoring of PACMA Documentation Generated

12.9. Environmental Monitoring of the Work
- 12.9.1. National and International Environmental Legislation
- 12.9.2. Guidelines Set Out in the Environmental Monitoring of the Project
- 12.9.3. Use of Recycled Materials and Materials Valorization
- 12.9.4. Reduction of the Carbon Footprint on Site

12.10. Waste Management
- 12.10.1. Waste Management Plan
- 12.10.2. Waste Management Legislation
- 12.10.3. Hazardous Waste Management
- 12.10.4. CDW Valuation

Module 13. Linear Works

13.1. Types of Linear Works
- 13.1.1. Road Works
- 13.1.2. Railroad Works
- 13.1.3. Bridges
- 13.1.4. Tunnels

13.2. Earth Moving
- 13.2.1. Terrain Analysis
- 13.2.2. Dimensioning of the Necessary Machinery
- 13.2.3. Control and Monitoring Systems
- 13.2.4. Quality Control
- 13.2.5. Standards of Good Execution

13.3. Longitudinal and Transversal Drainage
- 13.3.1. Drainage Review Project
- 13.3.2. Recalculation and Optimization Project Drainage
- 13.3.3. Execution Cost Savings Study

13.4. Foundations
- 13.4.1. Analysis of the Project's Geotechnical Study
- 13.4.2. Recalculation of Project Foundations
- 13.4.3. Preparation of the New Geotechnical Study
- 13.4.4. Discussion of New Geotechnical Study with the D.O.

13.5. Underpasses
- 13.5.1. Analysis of the Existing Project Underpasses
- 13.5.2. Drainage and Structural Capacity Resizing
- 13.5.3. Calculation Optimization
- 13.5.4. Underpass Optimization
- 13.5.5. Discussion of New Structure with the D.O.

13.6. Overpasses
- 13.6.1. Analysis of Existing Project Overpasses
- 13.6.2. Drainage and Structural Capacity Resizing
- 13.6.3. Calculation Optimization
- 13.6.4. Overpass Optimization
- 13.6.5. Discussion of New Structure with the D.O.

13.7. Viaducts
- 13.7.1. Analysis of the Existing Project Viaducts
- 13.7.2. Drainage and Structural Capacity Resizing
- 13.7.3. Calculation Optimization
- 13.7.4. Viaduct Optimization
- 13.7.5. Discussion of New Structure with the D.O.

13.8. Vertical and Horizontal Signage, Fenders and Additional Elements
- 13.8.1. Analysis of Applicable Regulations
- 13.8.2. Analysis of the Type and Quantity of Existing Project Signage
- 13.8.3. Optimization of Existing Signage
- 13.8.4. Analysis of Existing Fenders and Optimization of Them
- 13.8.5. Anti-Noise Screen Analysis and Optimization
- 13.8.6. Preparation of Report in Relation to the Optimization Performed
- 13.8.7. Discussion of Optimization Report with the D.O.

13.9. Railway Signaling and Track Equipment
- 13.9.1. Introduction to Railway Signaling
- 13.9.2. Signaling Systems Currently in Use
- 13.9.3. Introduction to Track Devices
- 13.9.4. Welded Long Bar
- 13.9.5. Plate Track
- 13.9.6. Specific Machinery for Railway Works

13.10. Environmental, Social and Cultural Measures
- 13.10.1. Analysis of the Measures Included in the Project
- 13.10.2. Study of Current Legislation
- 13.10.3. Adequacy of PACMA
- 13.10.4. Analysis of Social and Archeological Measures

Module 14. Hydraulic Works

14.1. Types of Hydraulic Works
- 14.1.1. Pressure Pipeline Works
- 14.1.2. Gravity Pipeline Works
- 14.1.3. Canals Works
- 14.1.4. Dam Works
- 14.1.5. Works in Riverbed Actions
- 14.1.6. WWTP and DWTP Works

14.2. Earth Moving
- 14.2.1. Terrain Analysis
- 14.2.2. Dimensioning of the Necessary Machinery
- 14.2.3. Control and Monitoring Systems
- 14.2.4. Quality Control
- 14.2.5. Standards of Good Execution

14.3. Gravity Piping Works
- 14.3.1. Survey Data Collection in the Field and Data Analysis in the Office
- 14.3.2. Re-Study of the Project Solution
- 14.3.3. Piping Assembly and Manhole Construction
- 14.3.4. Final Testing of Pipelines

14.4. Pressure Piping Works
- 14.4.1. Piezometric Line Analysis
- 14.4.2. Lifting Stations Execution
- 14.4.3. Piping and Valves Assembly
- 14.4.4. Final Testing of Pipelines

14.5. Special Valves and Pumping Elements
- 14.5.1. Types of Valves
- 14.5.2. Types of Pumps
- 14.5.3. Boiler-Related Elements
- 14.5.4. Special Valves

14.6. Canals Works
- 14.6.1. Types of Canals
- 14.6.2. Execution of Canals of Excavated Sections in the Ground
- 14.6.3. Rectangular Section Type
- 14.6.4. Desanders, Gates and Load Chambers
- 14.6.5. Auxiliary Elements (Gaskets, Sealants and Treatments)

14.7. Dam Works
- 14.7.1. Types of Dams
- 14.7.2. Land Dams
- 14.7.3. Concrete Dams
- 14.7.4. Special Valves for Dams

14.8. Works in Riverbeds
- 14.8.1. Types of Works in Riverbeds
- 14.8.2. Channeling
- 14.8.3. Riverbed Defence Works
- 14.8.4. River Parks
- 14.8.5. Environmental Measures in Riverbed Works

14.9. WWTP and DWTP Works
- 14.9.1. Elements of a WWTP
- 14.9.2. Elements of a DWTP
- 14.9.3. Water and Sludge Lines
- 14.9.4. Sludge Treatment
- 14.9.5. New Water Treatment Systems

14.10. Irrigation Works
- 14.10.1. Irrigation Network Study
- 14.10.2. Lifting Stations Execution
- 14.10.3. Piping and Valves Assembly
- 14.10.4. Final Testing of Pipelines

Module 15. Maritime, Airport, Industrial and Renewable Energy Works and Other Sectors

15.1. Works in Ports
- 15.1.1. Current Port Projects Regulations
- 15.1.2. Maritime Climate
- 15.1.3. Ports Executed with Sunken Caissons
- 15.1.4. Breakwater Dikes
- 15.1.5. Marinas

15.2. Coastal Works
- 15.2.1. Coastal Dynamics
- 15.2.2. Coastal Sediment Transport
- 15.2.3. Balance Profile in Beaches
- 15.2.4. Exempt Dikes in Coasts

15.3. Maritime Dredging and Earthmoving Works
- 15.3.1. Need for Dredging Works in Coasts and Ports
- 15.3.2. Machinery for the Execution of Dredging Works
- 15.3.3. Execution of Dredging Works

15.4. Works at Airports, Runways and Rolling Roads
- 15.4.1. Regulations Applicable to Airport Works
- 15.4.2. Airport Works Operation
- 15.4.3. Airport Signaling
- 15.4.4. Airport Work Restrictions

15.5. Works at Airports Terminal
- 15.5.1. Execution Project Analysis
- 15.5.2. BIM Project Analysis
- 15.5.3. Airport Terminal Project Team

15.6. Works in the Industrial Sector
- 15.6.1. Industrial Sectors of Reference
- 15.6.2. Civil Works in the Industrial Sector
- 15.6.3. BIM Methodology Application in the Industrial Sector
- 15.6.4. Methods of Work in Industrial Projects

15.7. Works for Renewable Energy Solar Farms Projects
- 15.7.1. Drainage Network Design and Calculation
- 15.7.2. Road Design and Calculation
- 15.7.3. Design and Calculation of Foundations
- 15.7.4. Elaboration of Reports Applied to Energy Projects

15.8. Works for Renewable Energy Wind Farms Projects
- 15.8.1. Drainage Network Design and Calculation
- 15.8.2. Roadway Design and Calculation
- 15.8.3. Design and Calculation of Foundations
- 15.8.4. Elaboration of Reports Applied to Energy Projects

15.9. R&D&I Works
- 15.9.1. Areas of Study for R&D&I Projects
- 15.9.2. Methodology of Work
- 15.9.3. Advantages of Project Development in the Field of R&D&I
- 15.9.4. Added Value of R&D&I Projects for the Company

15.10. Industrialization of Civil Engineering
- 15.10.1. Current Status of Civil Engineering Industrialization
- 15.10.2. Sector Projection
- 15.10.3. Technologies Applicable to Civil Engineering Industrialization
- 15.10.4. Future and Perspectives of Civil Engineering Industrialization

Module 16. Construction Planning (PMP)

16.1. Introduction and Life Cycle
- 16.1.1. Project Definition and Project Management
- 16.1.2. Areas of Expertise
- 16.1.3. Life Cycle
- 16.1.4. Interested Parties
- 16.1.5. Management Influence

16.2. Management Processes
- 16.2.1. Operation and Maintenance Project Management Processes
- 16.2.2. Management Process Groups
- 16.2.3. Interactions Between Processes

16.3. Integration Management
- 16.3.1. Development of the Articles of Incorporation
- 16.3.2. Development of the Scope Statement
- 16.3.3. Development of the Management Plan
- 16.3.4. Execution Direction and Management
- 16.3.5. Work Supervision and Control
- 16.3.6. Integrated Change Control
- 16.3.7. Project Closure

16.4. Scope Management
- 16.4.1. Scope Planning
- 16.4.2. Definition of Scope
- 16.4.3. Creation of Work Breakdown Structure
- 16.4.4. Scope Verification
- 16.4.5. Scope Closing

16.5. Time Management
- 16.5.1. Definition of Activities
- 16.5.2. Establishment of a Sequence of Activities
- 16.5.3. Resource Estimates
- 16.5.4. Estimated Duration
- 16.5.5. Schedule Development

16.6. Cost Management
- 16.6.1. Cost Estimates
- 16.6.2. Preparation of a Cost Estimate
- 16.6.3. Cost Control and Deviations

16.7. Human Resources Management
- 16.7.1. Schedule Control
- 16.7.2. Human Resources Planning
- 16.7.3. Team Formation
- 16.7.4. Team Development
- 16.7.5. Human Team Management
- 16.7.6. Human Resources Organizational Models
- 16.7.7. Theories on the Organization of Human Resources

16.8. Management Communications
- 16.8.1. Communications Planning
- 16.8.2. Information Distribution
- 16.8.3. Performance Reporting
- 16.8.4. Stakeholder Management

16.9. Risk Management
- 16.9.1. Risk Management Planning
- 16.9.2. Risk Identification
- 16.9.3. Qualitative Risk Analysis
- 16.9.4. Quantitative Risk Analysis
- 16.9.5. Risk Response Planning
- 16.9.6. Risk Monitoring and Control

16.10. Procurement Management
- 16.10.1. Purchasing and Procurement Planning
- 16.10.2. Recruitment Planning
- 16.10.3. Solicit Vendor Responses
- 16.10.4. Contract Administration
- 16.10.5. Contract Closure

Module 17. Settlement and Closing of Work

17.1. Work Prior to the Completion of the Work
- 17.1.1. Monthly Monitoring of Work Measurements
- 17.1.2. Monthly Monitoring of Non-Conformities
- 17.1.3. Monthly Monitoring of New Project Items
- 17.1.4. Administrative Management in Case of Existence of Modifieds

17.2. Final Measurement of the Work
- 17.2.1. Participants in the Final Measurement of the Work
- 17.2.2. Planning for the Final Measurement of the Work
- 17.2.3. Coordination of Work Measurements
- 17.2.4. Discussion with the Client of the Final Measurement of the Work

17.3. Review of Final Construction Plans
- 17.3.1. Control of Current Plans
- 17.3.2. Final Plan Delineation
- 17.3.3. As Built Plans Presentation

17.4. Non-Conformities Review
- 17.4.1. Monitoring and Closure of Non-Conformities Throughout the Development of the Project
- 17.4.2. Importance of Non-Conformities
- 17.4.3. Final Review of Non-Conformities Generated During the Work

17.5. Contradictory Prices Negotiation
- 17.5.1. Definition of Contradictory Pricing
- 17.5.2. Contradictory Price Negotiation
- 17.5.3. Contradictory Price Closing

17.6. Negotiation of Economic and Legal Closing of Construction Work
- 17.6.1. Summary of Data for Work Closure
- 17.6.2. Economic Negotiation for Work Closure
- 17.6.3. Legal and Administrative Closing of Work
- 17.6.4. Ongoing Files

17.7. Adequacy of Affected Areas of the Project
- 17.7.1. Definition of Affected Areas During the Development of the Works
- 17.7.2. Measures During the Execution of the Works
- 17.7.3. Measures in Affected Areas for the Closure of the Construction Site
- 17.7.4. Final Restoration of the Work

17.8. Work Acceptance Certificate
- 17.8.1. Act of Reception of Works
- 17.8.2. Figure of the Comptroller
- 17.8.3. Works Acceptance Certificate

17.9. Removal and Cleaning of Installation Areas
- 17.9.1. Withdrawal of Facilities Area
- 17.9.2. Cleaning of Areas Affected by the Works
- 17.9.3. Removal of Site Equipment

17.10. Subsequent Files (Price Revision and Possible Claims)
- 17.10.1. Types of Files Subsequent to the Acceptance of the Works
- 17.10.2. Price Revisions
- 17.10.3. Claim Files
- 17.10.4. Final Closure of the Work File

Module 18. Infrastructure Conservation and Maintenance

18.1. Conservation Contracts
- 18.1.1. Administrations Responsible for the Operation of Infrastructures
- 18.1.2. Types of Contracts
- 18.1.3. Conservation and Maintenance Companies
- 18.1.4. Purpose of Management and Maintenance Contracts

18.2. Bid Writing for Conservation and Maintenance
- 18.2.1. Objectives of the Bidding Company
- 18.2.2. Search for a Suitable Contract
- 18.2.3. Drafting of the Technical Offer
- 18.2.4. Preparation of Economic Offer
- 18.2.5. Management and Maintenance Contract

18.3. Figures Within the Conservation and Maintenance Contract
- 18.3.1. Maintenance Contract Manager
- 18.3.2. Maintenance Manager
- 18.3.3. Maintenance Technician
- 18.3.4. Maintenance Personnel

18.4. Conservation and Maintenance of Roads
- 18.4.1. Analysis of the Initial Situation
- 18.4.2. Customer Needs Analysis
- 18.4.3. Analysis of Routine and Special Tasks
- 18.4.4. Economic Monitoring of the Contract

18.5. Railroad Conservation and Maintenance
- 18.5.1. Analysis of the Initial Situation
- 18.5.2. Customer Needs Analysis
- 18.5.3. Analysis of Routine and Special Tasks
- 18.5.4. Economic Monitoring of the Contract

18.6. Port Operations
- 18.6.1. Figures Involved in Port Operations
- 18.6.2. Conservation Tasks
- 18.6.3. Maintenance Tasks
- 18.6.4. Engineering Works
- 18.6.5. Port Commercial Management

18.7. Port Conservation and Maintenance
- 18.7.1. Conservation and Maintenance of Roadways
- 18.7.2. Conservation and Maintenance of Piers
- 18.7.3. Conservation and Maintenance of Port Facilities
- 18.7.4. Conservation and Maintenance of Office Buildings

18.8. Economics of the Conservation and Maintenance Contract
- 18.8.1. Economic Studies of Public Services
- 18.8.2. Economic Engineering Applied to Public Services
- 18.8.3. Service Rate Regulation
- 18.8.4. Economic Planning of the Conservation and Maintenance Works

18.9. Machinery and Specific Personnel in Road Conservation and Maintenance
- 18.9.1. Human Team Sizing
- 18.9.2. Sizing of the Necessary Machinery
- 18.9.3. Specific Machinery Needs
- 18.9.4. New Technologies Applied to Conservation and Maintenance

18.10. Specific Machinery and Personnel in Railway Maintenance and Preservation
- 18.10.1. Human Team Sizing
- 18.10.2. Sizing of the Necessary Machinery
- 18.10.3. Specific Machinery Needs
- 18.10.4. New Technologies Applied to Conservation and Maintenance

Module 19. Infrastructure Repair

19.1. Works Related to the Maintenance and Repair of Infrastructures
- 19.1.1. Introduction to the State of Preservation of Infrastructures
- 19.1.2. Importance of Infrastructure Maintenance
- 19.1.3. Infrastructure Maintenance
- 19.1.4. Infrastructure Repair

19.2. Opportunities in the Bridge and Tunnel Repair Industry
- 19.2.1. Status of the Bridge Network
- 19.2.2. Status of the Tunnel Network
- 19.2.3. Status of Work in this Sector
- 19.2.4. Future of the Infrastructure Maintenance and Repair Sector

19.3. Infrastructure Inventory
- 19.3.1. Field Work
- 19.3.2. Field Data Processing in Cabinet
- 19.3.3. Processed Data Analysis
- 19.3.4. Coordination with the Customer of the Priority Works

19.4. Bridge Pathology Analysis
- 19.4.1. Analysis of Processed Data on Bridge Pathologies
- 19.4.2. Types of Pathologies Detected
- 19.4.3. Action Decision

19.5. Bridge Pathology Analysis
- 19.5.1. Analysis of Processed Data on Tunnels Pathologies
- 19.5.2. Types of Pathologies Detected
- 19.5.3. Action Decision

19.6. Infrastructure Monitoring
- 19.6.1. Importance of Infrastructure Monitoring
- 19.6.2. Infrastructure Monitoring Application Technology

19.6.3. Monitoring Data Analysis
19.6.4. Decision-Making for Action
19.7. Bridge Repair Work
19.7.1. Preparation for Bridge Repair Work
19.7.2. Common Pathologies
19.7.3. Action According to the Pathology
19.7.4. Documentation of the Proceedings
19.8. Tunnels Repair Work
19.8.1. Preparation for Tunnels Repair Work
19.8.2. Common Pathologies
19.8.3. Action According to the Pathology
19.8.4. Documentation of the Proceedings
19.9. Bridge Repair Equipment
19.9.1. Team Personnel in Charge of the Work
19.9.2. Machinery for the Execution of Works
19.9.3. New Technologies Applied to Bridge Repairs
19.10. Tunnels Repair Equipment
19.10.1. Team Personnel in Charge of the Work
19.10.2. Machinery for the Execution of Works
19.10.3. New Technologies Applied to Bridge Repairs

Module 20. The Smart Cities Future

20.1. The Digital Transformation of Citizen Services
20.1.1. A Three-Layer Structured Model
20.1.2. General Drivers, Technological Initiatives and Challenges
20.2. Data as Leverage
20.2.1. The Data Strategy
20.2.2. Governance Model
20.3. Cybersecurity
20.3.1. Network and Device Security
20.3.2. Data Security and Privacy
20.4. Global Platform and Sector Platforms
20.4.1. Solutions Ecosystem
20.4.2. The Value of Use Cases
20.5. Mobility in the Future of Cities
20.5.1. The MaaS
20.5.2. Use Cases
20.6. More Sustainable Cities
20.6.1. The Impact of Cities on the Environment
20.6.2. Solutions
20.7. New Technologies for Interaction with the City
20.7.1. New Technologies for City Management
20.7.2. New Technologies for the Citizen
20.8. Flexibility and Resilience of Smart Cities
20.8.1. Adaptation and Resilience in Smart Cities
20.8.2. Example of Adaptation of Cities to New Situations: COVID19
20.9. City Modeling
20.9.1. The City's Digital Twin
20.9.2. The Improvement, Redesign and Creation of New Cities
20.10. Smart Cities and the Digital Agenda 2030
20.10.1. Sustainable Development Goals and Smart Cities
20.10.2. City Suitability Tools for the SDGs

A comprehensive specialized program that will take you through the necessary learning to compete with the best in your profession"

06

Study Methodology

TECH is the world's first university to combine the **case study** methodology with **Relearning**, a 100% online learning system based on guided repetition.

This disruptive pedagogical strategy has been conceived to offer professionals the opportunity to update their knowledge and develop their skills in an intensive and rigorous way. A learning model that places students at the center of the educational process giving them the leading role, adapting to their needs and leaving aside more conventional methodologies.

TECH will prepare you to face new challenges in uncertain environments and achieve success in your career"

The student: the priority of all TECH programs

In TECH's study methodology, the student is the main protagonist.
The teaching tools of each program have been selected taking into account the demands of time, availability and academic rigor that, today, not only students demand but also the most competitive positions in the market.

With TECH's asynchronous educational model, it is students who choose the time they dedicate to study, how they decide to establish their routines, and all this from the comfort of the electronic device of their choice. The student will not have to participate in live classes, which in many cases they will not be able to attend. The learning activities will be done when it is convenient for them. They can always decide when and from where they want to study.

"At TECH you will NOT have live classes (which you might not be able to attend)"

The most comprehensive study plans at the international level

TECH is distinguished by offering the most complete academic itineraries on the university scene. This comprehensiveness is achieved through the creation of syllabi that not only cover the essential knowledge, but also the most recent innovations in each area.

By being constantly up to date, these programs allow students to keep up with market changes and acquire the skills most valued by employers. In this way, those who complete their studies at TECH receive a comprehensive education that provides them with a notable competitive advantage to further their careers.

And what's more, they will be able to do so from any device, pc, tablet or smartphone.

> *TECH's model is asynchronous, so it allows you to study with your pc, tablet or your smartphone wherever you want, whenever you want and for as long as you want"*

Case Studies and Case Method

The case method has been the learning system most used by the world's best business schools. Developed in 1912 so that law students would not only learn the law based on theoretical content, its function was also to present them with real complex situations. In this way, they could make informed decisions and value judgments about how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

With this teaching model, it is students themselves who build their professional competence through strategies such as Learning by Doing or Design Thinking, used by other renowned institutions such as Yale or Stanford.

This action-oriented method will be applied throughout the entire academic itinerary that the student undertakes with TECH. Students will be confronted with multiple real-life situations and will have to integrate knowledge, research, discuss and defend their ideas and decisions. All this with the premise of answering the question of how they would act when facing specific events of complexity in their daily work.

Relearning Methodology

At TECH, case studies are enhanced with the best 100% online teaching method: Relearning.

This method breaks with traditional teaching techniques to put the student at the center of the equation, providing the best content in different formats. In this way, it manages to review and reiterate the key concepts of each subject and learn to apply them in a real context.

In the same line, and according to multiple scientific researches, reiteration is the best way to learn. For this reason, TECH offers between 8 and 16 repetitions of each key concept within the same lesson, presented in a different way, with the objective of ensuring that the knowledge is completely consolidated during the study process.

Relearning will allow you to learn with less effort and better performance, involving you more in your specialization, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation to success.

A 100% online Virtual Campus with the best teaching resources

In order to apply its methodology effectively, TECH focuses on providing graduates with teaching materials in different formats: texts, interactive videos, illustrations and knowledge maps, among others. All of them are designed by qualified teachers who focus their work on combining real cases with the resolution of complex situations through simulation, the study of contexts applied to each professional career and learning based on repetition, through audios, presentations, animations, images, etc.

The latest scientific evidence in the field of Neuroscience points to the importance of taking into account the place and context where the content is accessed before starting a new learning process. Being able to adjust these variables in a personalized way helps people to remember and store knowledge in the hippocampus to retain it in the long term. This is a model called Neurocognitive context-dependent e-learning that is consciously applied in this university qualification.

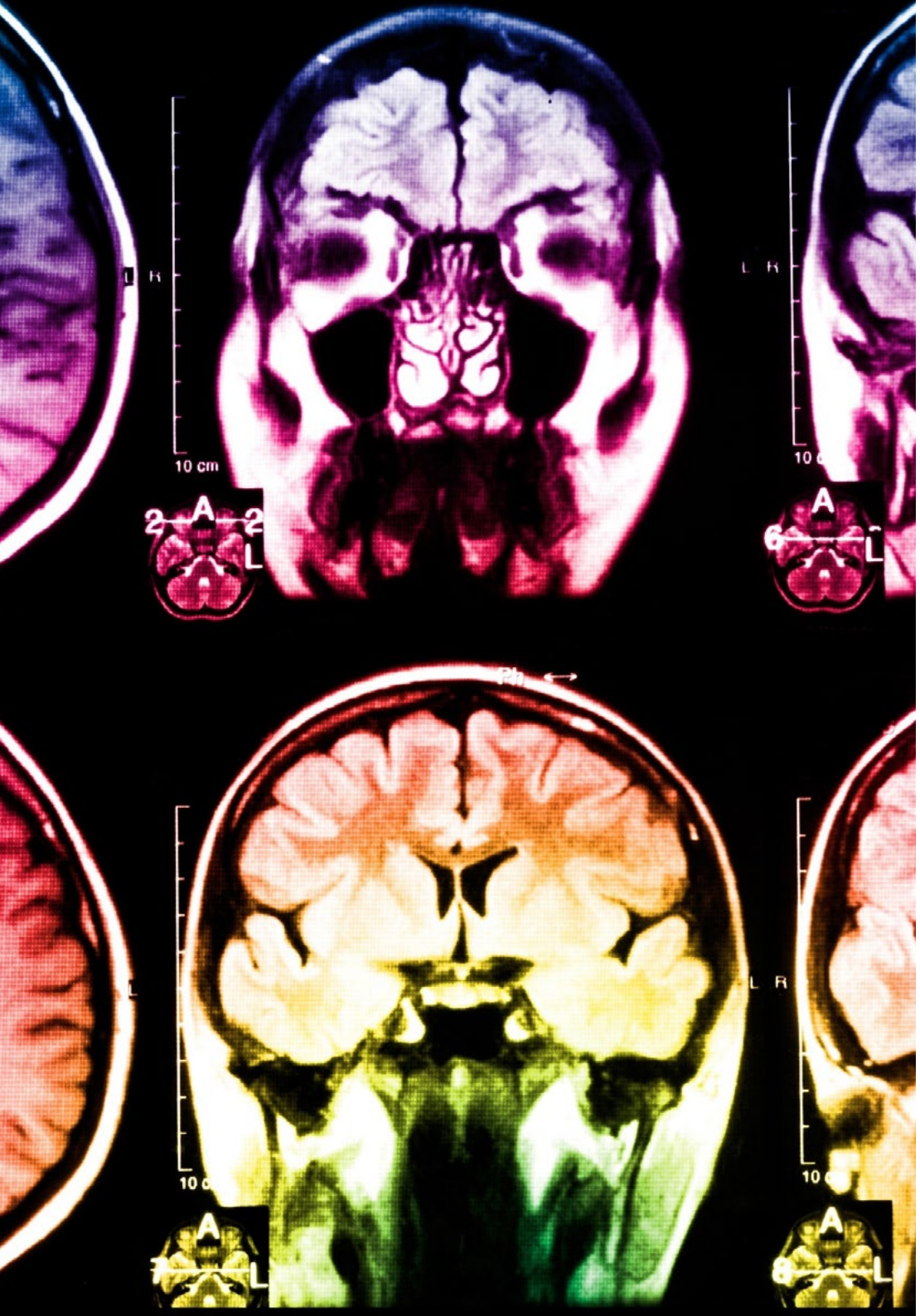
In order to facilitate tutor-student contact as much as possible, you will have a wide range of communication possibilities, both in real time and delayed (internal messaging, telephone answering service, email contact with the technical secretary, chat and videoconferences).

Likewise, this very complete Virtual Campus will allow TECH students to organize their study schedules according to their personal availability or work obligations. In this way, they will have global control of the academic content and teaching tools, based on their fast-paced professional update.

The online study mode of this program will allow you to organize your time and learning pace, adapting it to your schedule"

The effectiveness of the method is justified by four fundamental achievements:

1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that assess real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.
3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.
4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.



The university methodology top-rated by its students

The results of this innovative teaching model can be seen in the overall satisfaction levels of TECH graduates.

The students' assessment of the teaching quality, the quality of the materials, the structure of the program and its objectives is excellent. Not surprisingly, the institution became the top-rated university by its students according to the global score index, obtaining a 4.9 out of 5.

Access the study contents from any device with an Internet connection (computer, tablet, smartphone) thanks to the fact that TECH is at the forefront of technology and teaching.

You will be able to learn with the advantages that come with having access to simulated learning environments and the learning by observation approach, that is, Learning from an expert.

As such, the best educational materials, thoroughly prepared, will be available in this program:

Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

This content is then adapted in an audiovisual format that will create our way of working online, with the latest techniques that allow us to offer you high quality in all of the material that we provide you with.

Practicing Skills and Abilities

You will carry out activities to develop specific competencies and skills in each thematic field. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop within the framework of the globalization we live in.

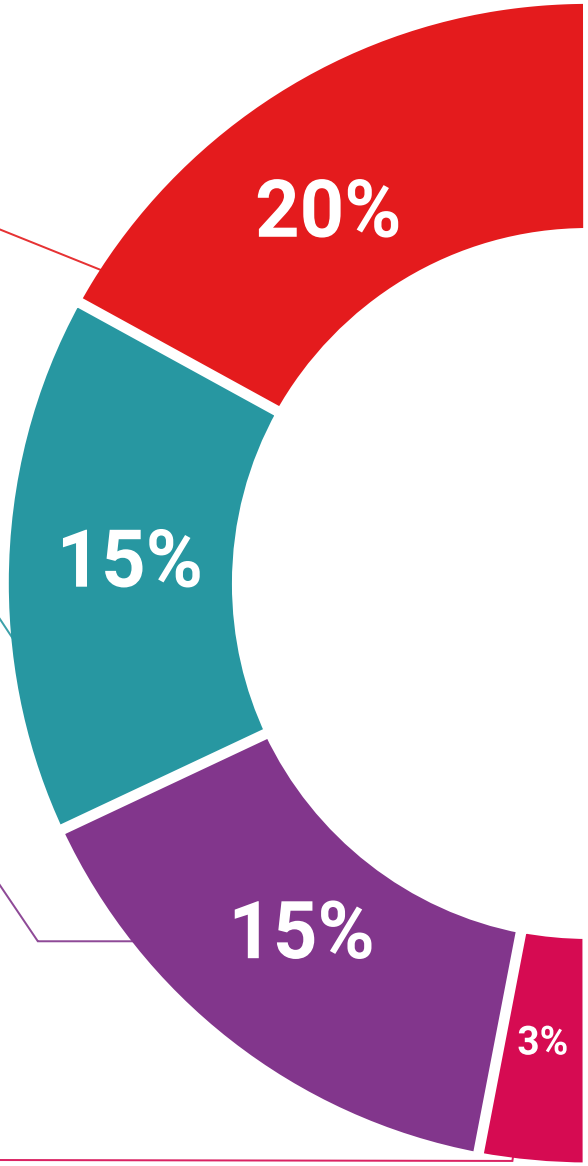
Interactive Summaries

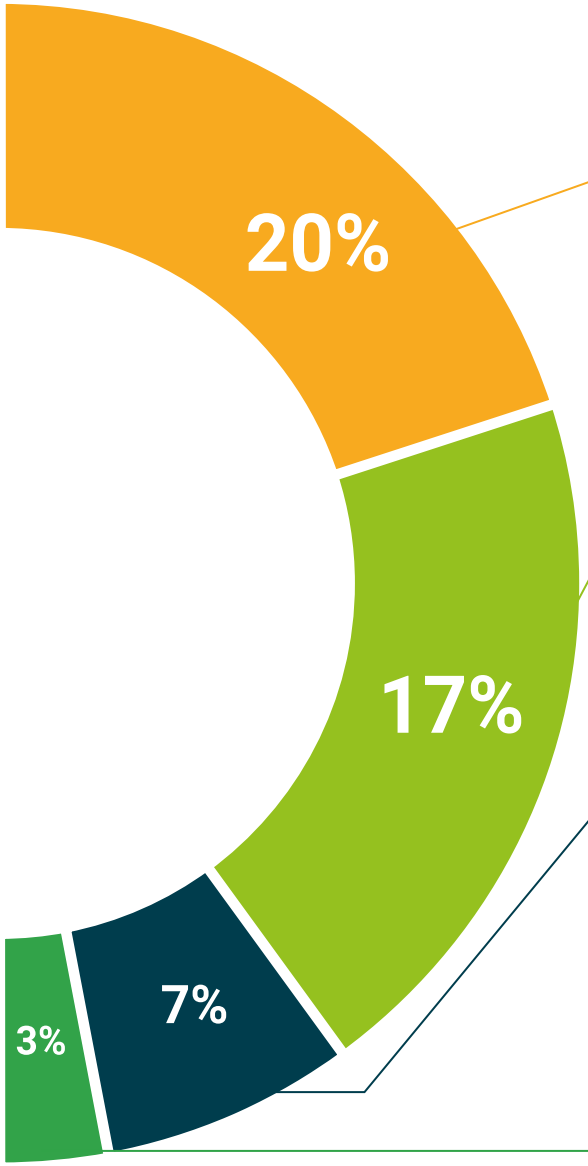
We present the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".

Additional Reading

Recent articles, consensus documents, international guides... In our virtual library you will have access to everything you need to complete your education.





Case Studies

Students will complete a selection of the best case studies in the field. Cases that are presented, analyzed, and supervised by the best specialists in the world.

Testing & Retesting

We periodically assess and re-assess your knowledge throughout the program. We do this on 3 of the 4 levels of Miller's Pyramid.

Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

Learning from an expert strengthens knowledge and memory, and generates confidence for future difficult decisions.

Quick Action Guides

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical and effective way to help students progress in their learning.

07

Certificate

This Advanced Master's Degree in Intelligent Infrastructures guarantees students, in addition to the most rigorous and up-to-date education, access to a diploma for the Advanced Master's Degree issued by TECH Global University.

Successfully complete this program and receive your university qualification without travel or laborious paperwork"

This private qualification will allow you to obtain a diploma for the **Advanced Master's Degree in Intelligent Infrastructures** endorsed by **TECH Global University**, the world's largest online university.

TECH Global University, is an official European University publicly recognized by the Government of Andorra ***(official bulletin)***. Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

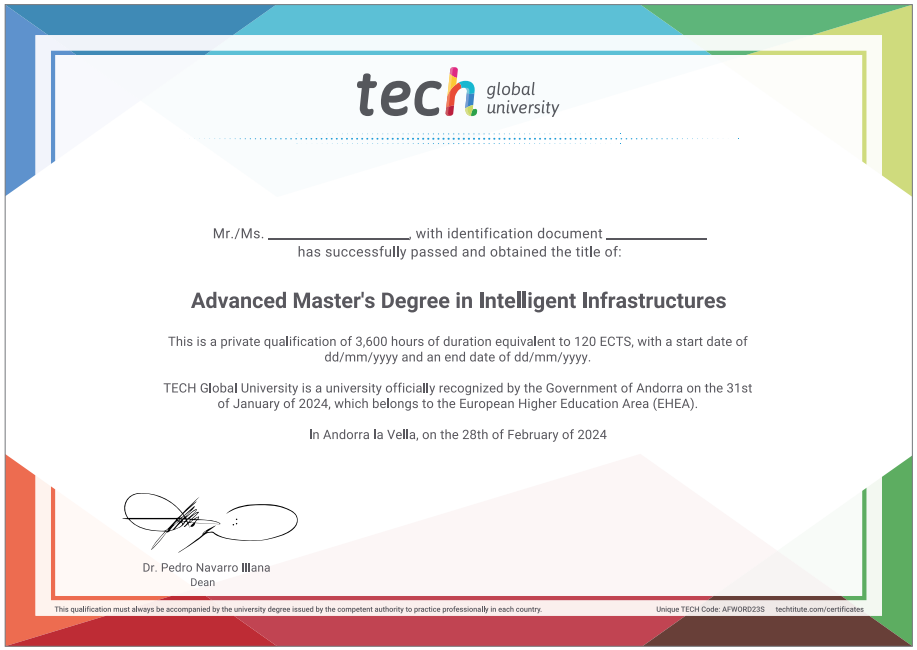
This **TECH Global University** private qualification, is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Advanced Master's Degree in Intelligent Infrastructures**

Modality: **online**

Duration: **2 years**

Accreditation: **120 ECTS**


tech global university

Mr./Ms. _____, with identification document _____
has successfully passed and obtained the title of:

Advanced Master's Degree in Intelligent Infrastructures

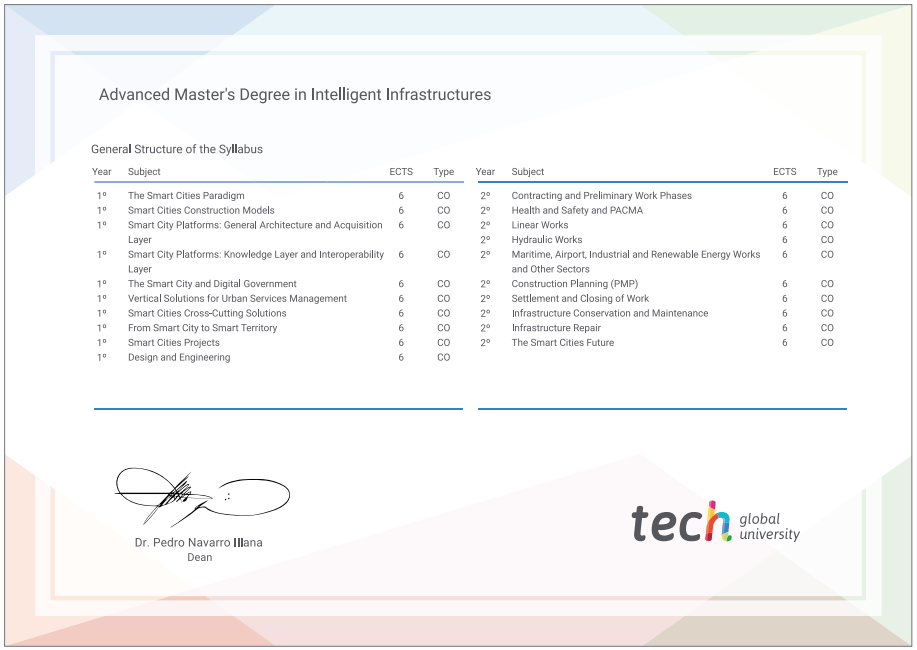
This is a private qualification of 3,600 hours of duration equivalent to 120 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates


Advanced Master's Degree in Intelligent Infrastructures

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	The Smart Cities Paradigm	6	CO
1º	Smart Cities Construction Models	6	CO
1º	Smart City Platforms: General Architecture and Acquisition Layer	6	CO
1º	Smart City Platforms: Knowledge Layer and Interoperability Layer	6	CO
1º	The Smart City and Digital Government	6	CO
1º	Vertical Solutions for Urban Services Management	6	CO
1º	Smart Cities Cross-Cutting Solutions	6	CO
1º	From Smart City to Smart Territory	6	CO
1º	Smart Cities Projects	6	CO
1º	Design and Engineering	6	CO

Year	Subject	ECTS	Type
2º	Contracting and Preliminary Work Phases	6	CO
2º	Health and Safety and PACMA	6	CO
2º	Linear Works	6	CO
2º	Hydraulic Works	6	CO
2º	Maritime, Airport, Industrial and Renewable Energy Works and Other Sectors	6	CO
2º	Construction Planning (PMP)	6	CO
2º	Settlement and Closing of Work	6	CO
2º	Infrastructure Conservation and Maintenance	6	CO
2º	Infrastructure Repair	6	CO
2º	The Smart Cities Future	6	CO

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*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

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Advanced Master's Degree
Intelligent Infrastructures

- Modality: **online**
- Duration: **2 years**
- Certificate: **TECH Global University**
- Accreditation: **120 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Advanced Master's Degree
Intelligent Infrastructures

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