# Master in<br/>City Sciences







## INTERNET OF THINGS ICT & NEXT GENERATION NETWORKS VISUAL ANALYTICS BIG DATA





# UNIVERSIDAD POLITECNICA DE MADRID Master of Advanced Studies in City Sciences 1st Edition. January-July 2014. Madrid, Spain WWW.Citysciences.com

# MCS Master in **City Sciences**

**FACULTY & STAFF** 

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SPECIALTY AREA DIRECTORS José Manuel Páez, Claudio Feijóo, Jesús Leal, Javier García-Germán, Ginés Garrido, Francisco Burgos, Julio Lumbreras, Óscar García, Andrés Monzón, Sergio Ramos, Bernardo Ynzenga

### PROFESSORS

Ana Bernardos, Iris Galloso, José Miguel Fernández Güell, José Manuel Páez, Claudio Feijóo, Jesús Leal, Javier García-Germán, Ginés Garrido, Julio Lumbreras, Óscar García, Andrés Monzón, Sergio Ramos, Bernardo Ynzenga, Juan Miguel Hernández de León, Gianluca Misuraca, Pierre Rossel, Mila Gasco, Luca Piovano, Ricardo Herranz, Antonio Saravia, Isidro Laso, Ángel Aparicio, María E. López Lambas, Óscar Martínez.

INTERNATIONAL GUEST LECTURERS With international renowned faculty in their respective fields, students are exposed to a unique experience. We currently have confirmed the presence of the following lecturers: Andy Hudson-Smith, José Holquin, Juan de Dios Ortuzar, David Wilson, Richard TT Forman, Iñaki Ábalos.

Invitations have been sent to the next professors and their confirmation will be published in the MCS website during the next months:

Pierre Belanger, Manuel Castells, Patrick Asunción Santamaría, José Ramón Casar, le Galès, Michael Weinhold, Luca Benini Gerd Sammer.



### **MCS AREAS**

with cities.

each other.

URBAN DESIGN

CITY SCIENCES BASIC Directed by José Manuel Páez

the areas from the master interact with

TRANSPORT & MOBILITY Directed by Andrés Monzón

The aim of this area is to give a general We need sustainable strategies to change overview of what does City Sciences our life styles to be less dependent of mean. It will introduce the importance of pollutant vehicles and to reduce the need of travel. Smart cities could provide the holistic vision of the problems related

the technological base to deploy less car There is an actual need for professionals dependent mobility patterns. Information that can have an interdisciplinary and communications systems will help to approach to the urban fact in order to give develop working, shopping, social trips in response and offer better solutions for the a more sustainable way. future challenges that cities will face. In The three pillars to built the sustainable

this area students will be taught how the city of the future are: planning urban space disciplines can work together and how all and to control urban sprawl (expansion of cities), to restrict the use of car in urban areas and to develop intelligent public transport systems of high quality.

This area will teach students about the urban mobility trends and modal split; externalities and mobility management; the land use and transport interactions; soft modes like walking and cycling; the integrated mobility strategies; city logistics and sustainable urban mobility

plans INFORMATION & COMMUNICATION TECHNOLOGIES Directed by Claudio Feijóo

This module of the MCS gathers all the knowledge related with the present and future of next generation networks, big sustainable the urban fabric, overcoming data, visual analytics and ICT governance. the exclusionary dichotomy in which the Next generation networks will support a renewed electronic communication located in antagonistic geographies. structure where opportunities lie in the Finding an agreement between nature provision of ubiquitous ultra-broadband and artifice is a critical element of the XXI connectivity, novel applications, appealing contents and the general support to

the sustainable development of all the regeneration specialty, this area aims to economic sectors. NGNs appear as the key technology for the provision of smart main challenges that the European city is transportation, smart grids, Internet of facing nowadays: increasing the capacity Things, big data, open government and all types of new services and applications. Internet of Things (IoT) will be the evolution of a monocentral city to a nodal supporting technology for any type city as a urban-territorial articulation; of smart environment. It is based on a network of sensors on physical objects

equipped with Internet protocols -therefore seamlessly integrated within Internet- and able to create communications networks automatically and send / receive information without direct user intervention -machine-toacquisition, data processing, wireless language. transmission and routing, and data fusion

### **INTERNATIONAL WORKSHOP**

SHANGHAI INTERNATIONAL WORKSHOP The workshop is a milestone where Complementing the holistic knowledge students will develop the acquired provided in the program, MCS includes knowledge and test it in an international environment. During this week there is an international stay in a renowned Chinese university, the Tongji University a change of pace in which they take a in Shanghai. In this university, MCS will break from the other specialties areas and develop an International Workshop on intensify their work in a practical case to Megacities in collaboration with the make the best out of it. Tongji University faculty.

Workshop fees are included in the Shanghai ranks as one of the top-5 world tuition fee of the MCS. Travel costs, megacities and is currently known as acommodation and personal expenses the New Silicon Valley for Architecture. are not included in the MCS tuition fee. Furthermore, Tongji University is recognized as one of the two best Chinese MADRID VISITS iniversities for Architecture and Civil naineerina.

MCS, with the support of the Sino-

Spanish Campus @ Tongji will develop

a one-week workshop on the real case of the City of Shanghai with the help of

local and international academics and

orofessionals.

In addition, there are planned trips in Madrid, where buildings, neighbourhoods and different infrastructures, subject of study, will be visited accompanied by their respective experts.

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### ABOUT MCS

The Technical University of Madrid (UPM) is promoting a unique and cross-cutting postgraduate program between the schools of engineering and architecture, with the ambition to become an international benchmark. The Master in City Sciences is an advanced program that provides a holistic view on the development of the city.

Nowadays, the city is the first economic and social engine worldwide. It is the object of interest of the most important companies. Traditional university courses have failed to respond to the urgent demand of professionals with a technical and comprehensive vision of the urban phenomenon. Answering this demand, the MCS program integrates disciplines related with planning, energy, sociology, economics and all the new technologies and infrastructures that are the core of the functioning of the city.

Right from the start, students from all nations will be trained in city-related areas both in a theoretical and practical way, in order to achieve a high professional level. MCS is based on real projects that will be





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ENTREPRENEURSHIP

Directed by Burgos & Garrido Arquitectos This area integrates different fields that city design has to take into account such as Landscape Design, Urban Design and Urban regeneration. Landscape Design will explore the demand of the contemporary city of a more extensive and manifold relationship with the natural environment that gave sense to the city in its origin. In a way in which the built artifact is strongly linked with its geographical and ecological context and thus the dynamic natural processes would enrich and make more city and the landscape where realities century city

Likewise, in the Urban Design and Urban provide an operational framework on the and scale of the intervention, with an increasing number of homes and uses; the and the growing need of renovation and revitalization of large parts of the residential fabric in the consolidated city.

### ECOLOGICAL URBANISM Directed by Javier García-Germán

This module considers the discussion on ecology and energy as an opportunity to reconsider the way cities are conceptualized. Existing perspectives A DO

**REGISTRATION PERIOD** ADMISSION PROCESS Until 31.12.2013 or until vacancies are Candidates have to follow a three-step filled. process: 1. Fill in the on-line application form. TUITION FEE 2. Send a motivation letter, CV and two 17,900€ This fee includes Shanghai international workshop fee and Madrid trips.

PARTICIPANTS Engineers, architects, economists and professionals profiles that demonstrate a relation with the city development. The MCS is open to students from all nations interested in becoming highly qualified professionals, able to understand and manage the multidimensional nature of the city.

REQUIREMENTS The course is intended for qualified engineers, architects and economists who have completed their bachelor degree or equal level certificate. The official language is English, therefore participants machine communications, M2M. Data must be able to communicate in this

recommendation letters. 3. The student will be called for a personal interview with a member of the academic comittee After the participant profile is evaluated

by the academic comittee, the candidate receives an email with the result of the deliberation. If positive, the candidate will have to pay the reservation fee (30% of the tuition fee) and complete the payment (70% of the total) before the beginning of the corresponding edition.



approached as case studies

This transdisciplinary approach has made that important international companies are involved in the MCS faculty, in the preparation of the final master thesis and in the possible subsequent employment.

The international character and the pursuit of excellence are reflected in the workshops together with other international universities and in the quality of the faculty staff, which aims to have the best international figure of each field

MCS is committed to the highest level of education combining professors of international prestige and a thorough participant selection process in order to make the best out of this course. The UPM will establish an admission process among all those engineers, architects, economists and graduates interested in becoming highly gualified professionals, able to understand and manage the multidimensional nature of the city.

> José María de Lapuerta MCS Directo



The aim of MCS is to train engineers and architects to take part in complex decision-making processes dealing with the future of our cities in international preparation of the Master's final thesis

> companies. JOB COUNSELING Lab. This way, the MCS will foster the MCS's main goal is the job placement of entrepreneurial interaction among them. specialized professionals who can address global problems and take important roles in companies or make contributions in fields such as environmental science, urban ecology or smart city policies.

PROFESSIONAL PAID INTERSHIPS The Master's final thesis project will be the prelude or the starting point of the relationship with the company that will later choose the best ranked student for paid interships.

ALUMNI NETWORK With the help of the Alumni Association, we put in contact participants of different editions to create the basis for research. knowledge and opportunity sharing

# MCS **Master in City Sciences**

VENTURE LAB FOR INNOVATION AND which give priority either to its spatial structure or to the way cities function is being superseded by a more consistent During the specialization process and the and holistic view which overlays its structure (spatial structure and built project, students will be invited to try out systems), performance (climate and use their ideas and projects in the Venture through time) and its connections and

exchanges with the environment. The aim of the course is delineate this new conceptualization of the city To achieve this end, scientific and technical knowledge will be merged with its cultural contextualization; these two tracks, the technological and the theoretical, will crisscross throughout the course to transmit a critical perspective on energy and sustainability that can propel effective applications on design.

SOCIETY & GOVERNANCE Directed by Jesús Leal

The sociology specialty aims to bring students to an understanding of the requirements that may have the city of the future. Cities that can meet the challenges of a cohesive and supportive society, with a clear identity, adapted to technological innovations, sustainable, well governed (with efficiency and justice), and based on a participatory democracy. These are values that are permanent and can be considered a high priority. Based on these requirements the specialty is divided into seven subtopics that would be developed from the analysis of specific cases.

ENERGY Directed by Óscar García

Energy is crucial for our lives. The modern society and our quality of life are based on the extensive use of energy. Today, there is a continuous objective of reducing the power consumption without losing quality of life. At the same time, the

becoming more necessary every day. A together with a very spread generation based on wind, solar, bio-mass and others will provide our future energy. Since power new loads such as electrical cars, it is crucial to improve the efficiency of all the equipment. Moreover, the presence of millions of sensors and detectors that will monitor and control our environment will force to use new forms of supplying energy

blocks of any IoT deployment While it is recognized that ICTs are changing city government systems, little is currently known about what this signifies, how ICT-driven changes are affecting governance processes and what are the successful technological and

and consolidation are the basic building

The ICT-governance subarea will present and discuss how current research and practice are addressing this gap and show how this change manifests itself new governance models, public in sector management practices, revised institutional processes and organizational structures

### **ENVIRONMENT & SUSTAINABILITY** Directed by Julio Lumbreras

environmental issues at urban scale serving as a starting point for discussion of strategic approaches to solve them. The main problems are those threats to present or future human well-being, resulting from human-induced damage to the physical environment, originating in urban areas.

The specialty is divided in five main topics: air quality management as an important issue with direct implications on urban planning, mobility and public management in general; air quality modeling as one of the main tools for the development of an urban air quality

plan; public health as the ultimate target of urban air quality plans; materials cycle in the city and municipal solid waste MCS is an exclusive degree, not offered in management. traditional careers, that has an increasing

Cities face increasing challenges when it comes to providing advanced digital services, or becoming the playing field for third party developers of services mix of conventional electrical generators and applications. The concept has to evolve in order to match with the existing reality, in which information availability and capacity of interaction with the the amount of energy will be higher to Administration at any time is an increasing demand. Likewise, there is a wide range of business opportunities to provide new ways of interaction with the city and its elements. The challenge lies in developing platforms that gather innovation openly from stakeholders and allow the rapid provision of applications following the paradigm of mobile communications.

REPJOL







**Deloitte**.

MADRID

### SPECIALTY AREAS The aim of the different areas is to cover a wide range of important city issues. To that sense, participants will have to combine theoretical subjects with practical work, projects deadlines and diverse teaching methods

INFORMATION AND DATA Additional supporting documents will be provided to all students periodically Some teachers may not hand over written nformation about their conference.

ATTENDANCE here will be a daily control of attendance



MCS will follow a strict policy regarding attendance, course withdrawal and ncorrect behaviour. \*MCS keeps its right to make changes in he program

### MINISTERIO DE FOMENTO GOBIERNO DE ESPAÑA

Magine. WY

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**SERVICES & APPLICATIONS** Directed by Sergio Ramos presence of clean energy resources is

organizational solutions to be adopted.

This area deals with the main



and current demand. Students will

become professionals with an absolutely

distinguishing profile in the job market.

Encouraging the relation university-

industry, the final thesis will be focused

on relevant issues in the professional

world, where the companies themselves

may be interested. This will allow students

to specialize in their field of interest at the

same time than they have the opportunity

to develop their thesis relating it with

the work that some of this international

companies are carrying on.

**PROGRAM INFO** 

Major international companies and the In collaboration with: top ones from the IBEX 35 have shown interest in this new professional profile, proving its importance.