

# Smart Cities

**1st Edition****Code:** 170018**Category:** Master**Credits:** 60.00**Language:** English**Start date:** 18/10/2017**Last session face-to-face session:** 10/02/2018**End date:** 07/09/2018

**Day and Time:** 1st Block On-site: From 18th October 2017 to 10th of February 2018, on-site weekly courses Wednesday and Thursday from 18 to 21h, Friday from 17 to 21h and Saturday from 9 to 14h. 2nd Block On-line: From 11th of February 2018 to 7th September 2018, on-line development of the city project (February to April) and the master thesis (May to July). The city project practicum work includes 2 visits to the city, one during the first week of February and another one during the last week of March. The master thesis is developed entirely on-line.

**Location:** Polytechnic School of the University of Girona and Science and Technology Park of the University of Girona

**Places available:** 60

## Prices and discounts

**Price:** 6.990 €

## Informative Sessions

	<b>Date</b>	<b>Time</b>	<b>Place</b>
Informative session 1	21/09/2017	18:00	Science and Technology Park University of Girona (Building Giroemprèn, Classroom 4-5)

See the Master's website (click [here](#))

## Presentation

Middle-sized cities require independent consultancy services for the adoption of global best practices in Smart Cities. In order to meet their needs, the students who enrol on our Master's Degree in Smart Cities begin to solve real city problems right from the start of their studies with a view to finding future employment in leading consultancy firms, companies and organisations around the world, as well as in important research centres. We are incredibly proud of the fantastic work they're doing in solving these real needs of cities. We offer the only official master's degree on this theme in Spain, and indeed Europe. We're unique in the world in terms of how we assist cities. If you want to be the next leader in smart cities leader, come and join us!

Our programme also includes two additional diplomas, designed as submodules of the full master's degree. They can be completed separately and subsequently count towards the full master's degree (courses completed within either of the two diplomas will automatically be included when enrolling on the master's degree):

**Specialist Diploma in Smart Urban Technologies (33 ECTS credits):**

This diploma has been designed as a module contained within the master's degree described above. The course runs concurrently

with the master's degree, sharing the same schedule and calendar but with fewer credits.

### **Diploma in Innovation for Smart City Projects (15 ECTS credits):**

This diploma only includes the city project and the prior preparation workshop week. It's designed for professionals with the aim of broadening their experience in different cities around the world.

## **Aims**

The main goal of the master's degree is to train professionals to lead cross-disciplinary teams for Smart City projects anywhere in the world. Our master's degree aims to offer university graduates specific training in information technologies, city planning and socioeconomics in order to deal with present-day challenges in modern cities.

During the master's degree our students complete an on-site practicum in different cities around the world where they develop real smart city projects working alongside city public authorities. Students who complete the programme will be qualified to work in the new and promising profession of smart urban technologist, an advantageous position from which to enter the incipient market for smart city solutions and consulting, as well as to deepen their knowledge in research careers.

## **Professional outings**

Due to the length and credit value of the two diplomas, they are geared more towards working professionals who wish to complete the master's degree in the near future but on a progressive basis (diploma modules count towards the full master's degree; courses completed as part of either of the two diplomas will automatically be validated on enrolling on the full master's degree in the future):

The master's degree and diplomas offer good professional opportunities for:

- Professional consultancy and entrepreneurship.
- Public administration.
- Technology and research centres.
- R&D departments in small and medium-sized enterprises, as well as in large companies.
- Technology-based departments in engineering firms and companies dedicated to innovation and the implementation of technological solutions.

## **Who the course is for**

University graduates from any area of specialisation who are interested in Smart Cities. We're open to any specialisation because we understand that the Smart City concept is broad and cross-disciplinary, ranging from more tech-oriented profiles to more social or economic ones. As such, our master's degree committee decides student admissions on a case-by-case basis, examining the merits of each CV.

## **Admission requirements**

Candidates for our master's degree must be university graduates from any specialisation with an interest in Smart Cities. Non-graduates may also apply to enrol on the master's degree programme and, if admitted, will receive a certificate of attendance. The master's degree committee will decide on the admission of applicants on a case-by-case basis, depending on their experience and CVs (please, send your CV to the email adress [secretaria.academica@fundacioudg.org](mailto:secretaria.academica@fundacioudg.org))

## **Syllabus**

### **Urban planning and ICTs: concepts and initiatives**

Review of various urban initiatives leading up to the Smart City: new urbanism ("smart code"), ruralism, fractal city, sustainable city, liveable city, knowledge city, creative city, digital city, smart city. Smart City experiences in the new city and existing city. Planned city case study. Transformed city case study. A look at different methodologies for urban planning (systematisation, standardisation, etc.). Differences between urbanism and urban planning. Study of the following concepts: planning 2.0, e-planning, web-based planning, etc.

---

## Measuring urban smartness and sustainability

Smart cities build on the sustainable city: existing indicators for measuring urban sustainability and necessary indicators for measuring urban smartness. New representation metrics for measuring urban smartness: Neogeography, Applied Geography, Geostatistics and spatial simulation, Spatial statistical models, Space temporal modelling, Collaborative mapping, Geotagging, Volunteered geographic information, Ontologies for urban planning, City Gml, Maps mash up, Tangible maps and planning. Control of urban systems: traffic, pollution, smart watering of public places (timers and programmers complemented with weather forecasting technology, humidity data, etc. to adjust irrigation, etc.). Smart environment: monitoring of air quality, water quality, noise, humidity, temperature, nocturnal light pollution.

---

## Urban visualization techniques

Virtual reality and modelling techniques. Description of techniques: remote sensing, 3D models and urban modelling in general, dynamic modelling, etc. Geovisual analytics, geovisualisation, data analysis for visual exploration. Visualisation and modelling of tracking data. Geographical Information Systems. Representation of geolocalised data and user maps: representation of data mining, representation of ubiquitous mobility, of mobile software activity, mobility maps (traffic in real time, etc.), mapping of anonymous data (urban flows, time patterns, etc.), combining user maps with open data, deformed maps (maps in continuous deformation according to a specific criteria).

---

## Modelling, simulation and optimisation

Techniques for simulating urban environments (transport, mobility, energy, services, etc.): simulation of spatially distributed dynamic systems, interaction in simulation models, modelling and simulation of complex systems, theory of information, complexity and stability of urban systems. Techniques for the optimisation of urban resources (transport, mobility, energy, services, etc.): spatial optimisation, route management and optimisation, fleet management and optimisation, traceability and logistics. Traffic management, traffic management in real time, ecodriving. Smart management of urban public transport. Parking management. Waste management.

---

## Data analysis and data mining

Data mining and automated learning techniques: Generic module on artificial intelligence. Automated learning and knowledge discovery techniques. Fuzzy and rough sets, logic and reasoning and spatial extensions. Ontologies for spatial analysis. Spatial data mining and analysis: focus on spatial and sequential data mining, management of spatial data (spatial data warehouse and spatial OLAP - Online Analytical Process). Decision support systems (DSS) in (spatially) distributed environments.

---

## Distributed software architectures and multiagent systems

Distributed software architectures: Services-oriented architectures (SOA), event-oriented architectures and complex event processing (CEP), multiagent architectures, etc. Multiagent systems: generic module focused on the agent technology (multiagent, representation through agents, etc.): urban prediction through agent technology, urban modelling through agent technology, urban simulation through agent technology, public participatory processes with agents, survey scalability with agents, etc.

---

## Energy monitoring and efficiency

Monitoring and urban control techniques for the efficient management of urban resources: data acquisition in urban and distributed environments, monitoring strategies. Monitoring and control of distributed resources (electricity, water, gas). Energy efficiency directives. Energy efficiency in buildings (certification, zero emissions, positive energy buildings). Energy management procedures (ISO50001, measurement and verification procedures). Energy monitoring techniques: smart grids, smart meters, communication infrastructures, energy efficiency management, active demand management. Technologies for efficient energy consumption (lighting, DHC, HVAC, energy distribution networks, etc.).

---

## Communication and information infrastructures

Telecommunication networks: Technologies for telecommunication infrastructures: Wireless networks (Wireless LAN -WLAN-, Wi-Fi and HiperLAN -IEEE 802.11 -, Wireless Metropolitan Area Networks (WMAN), MDS, WiMAX, and HiperMAN, etc.), wireless access to public networks, virtual and corporative networks, TCP/IP architecture, internet services, multiservice networks, routing and quality of service resource management, privacy and security. Sensor networks: ZigBee, EnOcean; Personal area networks,

Bluetooth, TransferJet, Ultra-wideband (UWB from WiMedia Alliance), web-sensors, etc.

---

## Social, ubiquitous and participatory technology

Person-centric ubiquitous technologies: hypermedia technologies, augmented reality, crowdsourcing. Social networks and public participation: e-participation, urban social networks, participation 2.0 (surveys, votes, polls), e-booking, e-payments. E-services and e-administration. Infrastructures to support public services: public safety and emergencies, e-health (telemonitoring, telemedicine, teleassistance), e-education, e-administration. Open Government and Open Data: successful experiences, public-private data collaboration, data protection, data reliability and security.

---

## New urban economics and city marketing

New urban business models and opportunities: Utility-based theory (theory based on the probability of occurrence which helps to explain choices that seem to contradict the expected value criterion), Wikinomics, Socialnomics, WikiCities, Crowdfunding, Lean City, Outernet and Shytech (how marketing will change in the future), the urban 4 Cs: credit, confirmation, consideration, conversion (from “promise” to “project”) for greater identity and image, economic dynamics in Smart Cities. Urban entrepreneurship: how to turn urban needs into business opportunities, urban innovation on the basis of citizens' needs. Application of business modelling to entrepreneurial ideas related to cities.

---

## Expert seminars

Seminars led by external experts on specific themes.

---

## City project

The city project is a supervised practicum integrated in the structure of the master's degree. It's completed in the second half of the programme. The city project consists of a training activity in which students apply the knowledge acquired in the first five unit blocks in order to find solutions to the real needs of real cities. The practical part of the city project lasts three months. Supervised by their degree tutors and tutors of their chosen cities, students work both on-site and online with their projects (two visits to the city during the three-month period: one at the kick-off and one halfway through the period). To complete the project, students must submit a project report and make an oral presentation of the results obtained.

---

## Master's Degree Final Project

The master's degree final project is a supervised practical study integrated within the structure of the master's degree. It's completed in the second half of the programme, immediately after concluding the city project. This project aims to introduce students to research and professional careers. Students must consolidate the acquired knowledge and demonstrate their capabilities in a particular field. They usually build on the work carried out in their city projects in order to complete their final projects. Therefore, the city project forms the basis of a research project but the latter adopts a more theoretical and analytical approach, moving away from the innovative business solution framework of the city project. On completion of their master's degree final projects, students must submit a written report and make an oral presentation of the results obtained.

---

## Results workshop

In this week-long workshop the students present their city projects and master's degree final projects. The presentation of the city projects is carried out in open format and representatives of the cities, other public authorities, companies, students and lecturers are invited to attend. It is a promotional event both for our students and for our studio. The master's degree final projects are presented in the second half of the week in a private and more academic format.

---

## Qualification

Master's Degree in Smart Cities of the University of Girona\*

\* Does not include shipping rates of qualification document.

Note: who does not have prior college degree will be entitled to receive under the same conditions, an attendance certificate issued by the Fundació UdG: Innovació i Formació.

## Teaching and Assessment

In the case of the both the master's degree and the diplomas, activity is structured into two main blocks of units in which the students' working procedures involve case studies and practical examples through theoretical and practical sessions, lectures, seminars and debates.

## Evaluation system

- Continuous assessment through case studies in all the units.
- The city project and the master's degree final project both require a written report and an oral presentation. The final grade is calculated on the basis of the assessment of the written report, the presentation and the assessment reports submitted by the city project tutors.
- Attendance at face-to-face units in Girona is compulsory. The City project, Master's Degree Final Project and results workshop are fully online; only the visits to the selected cities are compulsory. The oral presentation of both the city project and the master's degree final project in September can be carried out face-to-face or online.

## Financing

### Bank financing

Enrolled students can pay in installments.\*

The Fundació has agreements in place offering preferential terms for their students with the following entities:

- [Sabadell Consumer](#)
- [CaixaBank](#)
- [Banco Santander](#)

\* Only applicable to persons resident in Spain and upon acceptance by the bank.

## Teaching table

### Management

#### Dr. Josep Lluís de la Rosa

Has been a full professor at the University of Girona (UdG) Spain since 2010 and previously at the Rensselaer Polytechnic Institute (RPI), New York, USA (2008-2010). Director of the EASY Research Centre and of the Master's Degree in Smart Cities of the UdG. He holds an MBA from the UdG and a PhD in Computer Science from the Autonomous University of Barcelona (UAB). De la Rosa is an expert in intelligent agents, social networks, virtual currencies and digital preservation and their application to the market. He has contributed more than 200 international publications and has supervised more than 20 PhD theses. He's a researcher with entrepreneurial vision who has created several spin-off companies, starting with the world's first robotic soccer team as far back as 1996. His research into complementary and virtual currencies started in 2006 and he soon became fascinated by the disruption of the Blockchain and SmartContracts technologies and their advantages. Since then, he has been working on this theme in order to design new types of money suitable for the Internet in particular, as well as in many other applications.

---

### Coordination

#### Dr. Andrés El- Fakdi

Is an assistant lecturer and researcher in the Department of Electrical Engineering, Electronics and Automation of the University of Girona. He's the Laboratory director and promoter of the EASY Centre research group. He's also a member of the coordination team of the Master's Degree in Smart Cities of the University of Girona. He holds a Degree in Electrical Engineering from the University of Girona and a PhD in computer science from the same university. His research interests are focused on contributing to

the development of machine learning techniques for Decision Support Systems (DSS) in order to increase productivity and effectiveness in complex scenarios. His PhD research focused on the study and development of machine learning techniques and its application to robotics. This research successfully concluded with the use of learning algorithms to overcome non-programmed changes in the environmental conditions that lead an autonomous robot to fulfil a particular task. Meanwhile, his post-doctoral research focuses on the study of Big/Open Data applications and on the design and development of similar machine learning solutions for knowledge discovery.

---

## Teaching staff

### TBA

Virtual reality and Modeling Techniques. Techniques description: remote sensing, 3D models and urban modeling in general, dynamic modeling, etc. Geo-visual analytics, geo-visualization, visual exploratory data analysis. Visualization and modeling of tracking data. Geographical Information Systems. Geo-localized representation and user maps: data mining representation, ubiquitous mobility representation, high software mobility activity, mobility maps (real time traffic, etc), mapping anonymous data (on urban flows, time patterns, etc.), mixing user maps with open data, deformed maps (maps in continuous deformation according to an specific criteria).

Telecommunication networks: Technologies for telecommunication infrastructures, Wireless networks (Wireless LAN -WLAN-, Wi-Fi and HiperLAN -IEEE 802.11 -, Wireless Metropolitan Area Networks (WMAN), MDS, WiMAX, and HiperMAN, etc.), wireless access to public networks, virtual and corporate networks, TCP/IP architecture, internet services, multiservice networks, routing and quality of service resource management, privacy and security. Sensor networks: ZigBee, EnOcean; Personal area networks, Bluetooth, TransferJet, Ultra-wideband (UWB from WiMedia Alliance), web-sensors, etc.

---

### Dr. Andrea Bikfalvi

is teaching and research staff in the Department of Business Administration and Product Design at the University of Girona (Spain). She holds a PhD in Business Administration. She is currently the deputy director of the Chamber of Commerce Chair of Family Business at the same university. During her trajectory she conducted several research projects for the regional government of Catalonia, Spain, as well as a series of EU projects. Her main research interest is in holistic approaches of innovation in all types of organizations –mainly, but not limited to- public administration, private enterprises and education. She published research in international journals such as Technovation, Service Business, European J. International Management, Journal of Organizational Change Management and the Journal of Family Business Strategy.

---

### Dr. Josep Lluís de la Rosa

Has been a full professor at the University of Girona (UdG) Spain since 2010 and previously at the Rensselaer Polytechnic Institute (RPI), New York, USA (2008-2010). Director of the EASY Research Centre and of the Master's Degree in Smart Cities of the UdG. He holds an MBA from the UdG and a PhD in Computer Science from the Autonomous University of Barcelona (UAB). De la Rosa is an expert in intelligent agents, social networks, virtual currencies and digital preservation and their application to the market. He has contributed more than 200 international publications and has supervised more than 20 PhD theses. He's a researcher with entrepreneurial vision who has created several spin-off companies, starting with the world's first robotic soccer team as far back as 1996. His research into complementary and virtual currencies started in 2006 and he soon became fascinated by the disruption of the Blockchain and SmartContracts technologies and their advantages. Since then, he has been working on this theme in order to design new types of money suitable for the Internet in particular, as well as in many other applications.

---

### Dr. Andrés El- Fakdi

Is an assistant lecturer and researcher in the Department of Electrical Engineering, Electronics and Automation of the University of Girona. He's the Laboratory director and promoter of the EASY Centre research group. He's also a member of the coordination team of the Master's Degree in Smart Cities of the University of Girona. He holds a Degree in Electrical Engineering from the University of Girona and a PhD in computer science from the same university. His research interests are focused on contributing to the development of machine learning techniques for Decision Support Systems (DSS) in order to increase productivity and effectiveness in complex scenarios. His PhD research focused on the study and development of machine learning techniques and its application to robotics. This research successfully concluded with the use of learning algorithms to overcome non-programmed changes in the environmental conditions that lead an autonomous robot to fulfil a particular task. Meanwhile, his post-doctoral research focuses on the study of Big/Open Data applications and on the design and development of similar machine learning solutions for knowledge discovery.

---

---

**Dr. Joaquim Melendez**

He has a B.S. degree in Telecom Engineering, from the Universitat Politècnica de Catalunya and a PhD from the Universitat de Girona. He worked as junior research in 1991 at Cognivision research and as electronic engineer between 1991 and 1992 at OPTIMUS SA. In 1992 started the academic career at the University of Girona where in 1999 he won a permanent position at the Department of Electrical, Electronic and Automation Engineering where he has developed his career until now. He has been responsible of several engineering degrees, master programs and coordinator of the PhD Program in Technology at this University from 2007 until 2015. He leads the research group “Control Engineering and Intelligent Systems, eXiT” (<http://exit.udg.edu>), at the Institut d’Informàtica i Aplicacions, focusing his research on data-driven methods for process supervision and decision support with emphasis in applications for power distribution networks and energy efficiency.

---

**Dr. Victor Muñoz**

Computer Scientist (BSc 2005, PhD 2011, MSc 2016), specialized in Artificial Intelligence, with a background of 10+ years in both academic and private sector. Co-founder of a spin-off in the University of Girona since 2011, he has developed several tasks involving planning, coordination and development of AI-based projects. His main research lines are: Robustness, SAT, SAT Modulo Theories (SMT), CSP, COP, combinatorial auctions, complexity theory, multi-agent systems, reputation, trust, planning and scheduling. His current interests also include natural language processing, social networks and blockchain.

---

**Dr. Sergi Nuss**

PhD in Geography and Environmental Science. Sergi is a part time professor on Environmental Policies, Low-carbon and Sustainable Urban Development, and Sustainable Tourism for the Geography Department of UdG. Since 2016 he is member of the steering committee of the Official Master’s Degree in Smart Cities – UdG. Out of the University, Sergi is Project Manager at Pau Costa Foundation, in a project on the introduction of grazing herds in forests as wildfires prevention strategy. He also collaborates with Arrels a Taula, a consultancy working on territory, gastronomy and peasantry projects. Last but not least, Sergi is Board Member and Activist at Associació Naturalistes de Girona, since 1994.

---

**Mr. Marc Pons**

Freelance telecom engineer (UPC & U.Paris X) who’s also part time teaching as assistant lecturer in the Department of Business Administration and Product Design at the University of Girona (Spain). He has a post grade of Telecommunications Infrastructures and he holds several masters: MBA (UB-UAB-UPC), Business Innovation and Technology Magnagement (UdG) and Tourism Management and Planning (UdG). He has made some research as part of his in progress PHD in the field of green manufacturing, green product innovation and Energy efficiency, that has been published in international journals as Journal of Cleaner Production or InTech books. He has experience in Spain and abroad in the private sector as an engineer (MATRA-Aerospatiale-EADS). He also knows the public sector as a provider of systems and solutions but also as a board member of public companies (FISERSA) and professional organizations.

---

**Dr. Víctor Torres**

Holds a PhD in Telecommunication Engineering from Universitat Pompeu Fabra in 2008. He previously worked as a postdoctoral researcher and lecturer at Universitat de Girona at the Broadband Communications and Distributed Systems (BCDS) research group. Former assistant professor at Universitat Politècnica de Catalunya from 2010 to 2011, visiting assistant professor at Universitat Pompeu Fabra from 2008 to 2010 and member of the Distributed Multimedia Applications Group (DMAG) research group from 2003 to 2011. Technical coordinator and researcher in several European and national research projects in open innovation, digital rights management (DRM), intellectual property rights, metadata, multimedia content representation and distribution, security, distributed applications, social networks and recommendation, such as NIR-VANA, AXMEDIS, VISNET-II, VISNET, VARIAZIONI and MIREIA. He has contributed to the ISO/IEC 21000 (MPEG-21) standard. He has co-authored several papers published in international journals and presented in leading international conferences. He has acted as a reviewer for IEEE Multimedia, Computer, ETRI journal and El profesional de la informacion. He currently works as RDI Manager at TECNIO Centre Easy (Universitat de Girona).

---

**Dr. Joan Vicente**

PhD in Geography (UAB) and Director of the Department of Geography of the Universitat de Girona. Specialized in urban and strategic planning.

---

\*Management reserves the right to modify the teaching staff, if necessary, to ensure the levels of quality and professional category.

# Promoting entities

Fundació UdG: Innovació i Formació



---

Tecnio Centre EASY





