SMART CITIES – summer course

July 29 – August 16, 2018

4 Credits (minimum 52 academic hours)

The last decades have witnessed unprecedented population and urbanization growth with the implication that today, for the first time in human history, more than half of world population lives in cities. In traditionally rural societies such as India and China the proportions today of urban population are 55% (China) and 31%, when estimations and predictions shows that in 30 years approx. China and India will lead the world's urban population. The consequences of the fast increasing of population in the cities and towns: most if not all social, cultural, political, environmental and security problems are essentially urban problems, that never seen before in the entire world.

Those problems created an urgent need to find a smart solution that expressed in a new race for developing smart cities and to find the best way to deal with the complexity of the new urban era.

In China, Smart cities are the fundamental solutions to the urbanizations problems and were regarded as national strategies with billions invested from both the government and private sectors. Since 2013, there have been more than 90 cities in the list for trial of smart cities constructions.

In India, as from 2015, the government gives a great importance to urban rejuvenation and urban transformation, therefore providing a huge amount of resources in order to execute 100 smart cities in the next few years.

The City of Tel Aviv was ranked as [one of the most innovative cities in the world](#) by Citibank and the Wall Street Journal and in 2014, awarded the title, "World's Smartest City" at the [Smart City Expo World Congress](#) in Barcelona, due to developing a strategy to integrate its high-tech ecosystem and leading innovative technologies into a smart city strategy.

Tel Aviv University established the "City Center", a research center for cities and urbanism, managed and lead by TAU professors in various aspects, such as: Architecture, Earth Sciences, Environmental Studies, Geography and Human Environment, Industrial Engineering, Big Data, Law, Philosophy and Theatre arts.

The TAU "City Center" plans to launch its first academic course with both the theoretical side in class and practical side as a workshop lead by experts and officials of the Tel Aviv Municipality this coming summer for Israeli students.

With this highly relevant topic to many countries, especially to China and India, we would like to seize this opportunity and to offer this innovative and unique program in English for outstanding international students mainly but not only from China and India. It will be an opportunity to deal with this issue in its many aspects and to enlighten them with Tel Aviv and TAUs' smart resources and experience for a better and smarter future.

This is a unique interdisciplinary program meant for students from various fields. We believe that, similarly to the researchers in the Smart City center, bringing students from different disciplines will enrich the learning experience.

We have already checked with a few universities in China regarding their interest in such a course and we got many positive feedbacks, for example from Tsinghua, Beijing University, South East University and more.

In addition, Prof. Juval Portugali traveled to China and India in the past and gave briefings on the "Smart Cities" topic in a few universities and governmental institutions, such as Tsinghua and Peking University and in India, Bangalore Urbanism research center. He also mentioned the growing and big interest of the Chinese and Indians to extend cooperation in this issue.

Admission conditions

In order to be considered eligible for the program, applicants should be enrolled as a student in an institution of higher Education, recognized by TAU.

GPA: This summer program is open to qualified third year undergraduate students and Master Degree students with a minimum GPA of 3.0 (equivalent to a B or 80%). The students will have to submit both their undergraduate transcript and the grades of courses they already took in their Master. In exceptional cases, students with lower GPAs will be considered if their student essay, teacher recommendations and other factors show special circumstances to be taken into consideration.

Because this program refers to a wide spectrum of topics, **it is open to students from every field of study**; during the second part of the programs, the students will work with a mentor specifically according to the field of studies.

In addition, applicants will have to submit:

- ◉ Undergraduate or graduate degree from a recognized university.
- ◉ Proof of appropriate English skills – TOEFL/IELTS/CET.
- ◉ Two letters of recommendation.

For further details, please refer to the section on the application process.

Course description and syllabus

Instructors: Juval Portugali, Ronit Purian

The notion of smart city recently captures a central position in the discourse and research on cities and urbanism. The basic idea is that the application to the domain of cities of the rapidly developing ICT (information communication technologies) opens for the first time new possibilities and opportunities to solve some chronic urban problems (e.g. traffic congestion) as well as to handle some newly recognized environmental and social problems. While the "smartness" of cities is a new phenomenon strongly connected to the exceptionally innovative character of the present age, a wider time perspective reveals that since its first appearance some 5500 years ago, the city has always been "smart" in the sense that it represented in its structure and dynamics the most innovative elements of its time and was the environment within which new innovations emerged.

As specified in the list of topics below, the course will open with an archaeological-historical perspective; will elaborate on the various aspects and challenges of current smart cities and will put the notion of smart city within the theoretical context of CTC (complexity theories of cities). Then, some of the most prominent issues associated with smart cities will be discussed: Ethics, transportation, governance, urban planning and design, sustainability and resilience.

Organization and Participants

Organized within the framework of City Center – TAU Research Center for Cities and Urbanism, the various topics will be delivered by the instructors, TAU faculties who are experts in the various aspects of smart cities, and guest lecturers.

Cooperation with the Tel Aviv Municipality City Planning Division

As part of the program, the students will visit Tel Aviv Municipality's facilities and will meet with city officials that deal with Smart city solutions, according to their field of studies. This way they will get a practical side and most valuable information while studying in the city that won the title of the "smartest city in the world 2014". We believe that this component will make the program exceptionally well-rounded.

Project

The students will form research groups of 3-5 persons; each group will choose its own research topic on which it will work during the course, and will present it twice: firstly in the middle of the course as a research proposals, and secondly at the end of the course as a full scale paper.

Grades: 30% presentation of the research proposal; 70% the final paper.

Attendance: Students are required to attend all classes and visits.

Readings: Please see Bibliography.

Contact information:

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Topics & lectures

1. **Introduction: The (smart) city in history**. Juval Portugali, July 29

2. **Definitions of Smart Cities**. Juval Portugali, July 29

3. **Big data, IoT, cloud computing**. Ronit Purian, July 30; Liora Shechter TA CIO, August 1; Jacob Mendel, August 2; Industry (startups and VC), August 9

4. **Complexity theory, CTC and Smart Cities**. Juval Portugali, July 30, August 13-14

5. **Ethics, privacy and human rights**. Limor Shmerling Magazanik, Israeli Privacy Protection Authority, August 5; Ronit Purian, August 12

6. **Environment, sustainability and resilience**. Doron Sapir, July 31; Orli Ronen, August 6; Alon Eliran, Yonatan Shaham, August 7

7. **Smart transportation and mobility**. TA Municipality, August 1; Golan Ben-Dor, August 7; Tal Raviv, August 8; Nir Fulman, August 12

8. **Planning and design in a Smart City**. TA Municipality (Kasem Slalha: tools and 3D simulation), August 1; Juval Portugali (PSS, CPP), August 6; Nir Fulman (GIS lab), August 12

9. **Smart urban governance**. TA Municipality, August 1; Jonathan Dortheimer, August 2; Guy Shani, August 6; Ophir Pines, August 13

10. Presentations of groups' projects

Sun	Mon	Tue	Wed	Thu
29	**30**	**31 (trip 1)**	**1 (trip 2)**	**2 (Lab 1)**
Prof. Juval Portugali: **Course overview.** **1. The (smart) city in history** **2. Definitions of Smart Cities**	**Prof. Juval Portugali:** **4. Complexity theory and Smart Cities (1)** Dr. Ronit Purian: 3. Big data, IoT, cloud computing (1)	9:00-14:00 Hiriya Recycling Park – Center for Environmental Education Doron Sapir, Chairman of Hiriya, TA Deputy Mayor and Chairman of the Building and Planning Committee: 6. Environment, sustainability (1)	Tel Aviv Municipality 9:00-14:00 Liora Shechter, CIO; mobile app; smart card; open data; BI; Security Control Center & Municipal Situation Room: 3. Big data, IoT, cloud computing (2); 9. Smart urban governance (1) 15:00-16:00 Traffic Control: 7. Transportation (1); 3D simulation tools: 8. Planning & design in a Smart City (1)	12:00-12:30 Discussion: Group projects (1) 12:30-13:30 Jacob Mendel: 3. Big data, IoT, cloud computing (3: Blockchain) 13:30-15:00 Jonathan Dortheimer: 9. Smart urban governance (2: Crowd sourcing)
5 (Yad-Avner 115)	**6**	**7**	**8**	**9 (Yad-Avner 115)**
Prof. Juval Portugali: **8. Planning and design in a Smart City (2: PSS, CPP)** 13:30-15:00 Limor Shmerling Magazanik, Israeli Privacy Protection Authority: 5. Ethics, privacy and human right (1)	12:00-13:30 Dr. Orli Ronen: 6. Environment, sustainability and resilience (2) 13:45-14:45 Guy Shani: 9. Smart urban governance (3) 14:45-15:00 Discussion: Group projects (2)	12:00-12:55 Dr. Alon Eliran: 6. Environment, sustainability (3) 13:05-14:00 Yonatan Shaham: 6. Environment, resilience (4) 14:05-15:00 Golan Ben-Dor: 7. Transportation (2)	12:00-15:00 Dr. Tal Raviv: 7. Transportation (3): Flexible and demand responsive transit Shared mobility systems	3. Big data, IoT, cloud computing (4): 12:00-12:45 Michelle Specktor: IPgallery 12:55-13:40 Noga Kap: i3 Equity Partners 13:50-14:35 Eyal Shmueli: Simgo 14:45-15:00 Discussion: Group projects (3)

12 (Lab 2)	13	14	15	16
Dr. Ronit Purian: 5. Ethics, privacy and human right (2) Nir Fulman: 7. Transportation (4) 8. Planning and design in a Smart City (3: GIS lab)	**Prof. Juval Portugali: 4. Complexity theory and Smart Cities (2)** Ophir Pines: 9. Smart urban governance (4)	**Prof. Juval Portugali: 4. Complexity theory and Smart Cities (3-4)**	Presentations of groups' projects	Presentations & course summary

Class: Dan David building, room 106; **lab:** Yad Avner building, room 232 (10 Zelig, north to the campus). Please notice that several classes will take place at Yad Avner building, room 115.

July 31: A tour of Hiriya between 9:00-14:00 (13:00 lunch); the bus will pick you up at the Einstein Dormitories, 76 Einstein St. at 9:00am for transport to Hiriya; at 14:00pm from Hiriya back to the dorms.

Lecture by Doron Sapir, Chairman of the Dan Cities Association and Hiriya Recycling Park, and Tel Aviv Deputy Mayor.

The Center for Environmental Education
https://www.hiriya.co.il/eng/The_Center_For_Environmental_Education

The transfer station https://www.hiriya.co.il/eng/The_Transfer_Station, https://www.hiriya.co.il/eng/ArrowBio, etc.

The RDF (Refuse Derived Fuel) plant https://www.hiriya.co.il/eng/The_RDF_Plant

Mountain View: https://www.hiriya.co.il/eng/The_Landscape_Architects_Vision

At 13:00: Lunch and an explanation about "Hiriya Coffee" social and ecological choices: The cafe's business manager, Naomi Yaffe: 050-7518060, coffee@hiriya.co.il

August 1: A visit to Tel Aviv Municipality between 8:30-14:00 and 15:00-16:00 (14:00 free lunch).

8:30-14:00 – Computing Division, 4 Antokolsky Street, Tel Aviv. Attached please find a file with the agenda for the main part of the day.

15:00-16:00 – Engineering Division, 5 Philon Street, Tel Aviv. (1) Avi Wiesman, Director of traffic control and traffic lights operation center; and (2) Kasem Slalha, Planning Department.

Lectures abstracts (in alphabetical order):

Researchers

Assessing the Impacts of Dedicated Bus Lanes on Urban Traffic Congestion and Modal Split with an Agent-Based Model (MATSim)

In the following lecture, the state of the art Multi-Agent Transport Simulation (MATSim) framework will be presented. MATSim exists as an open-sourced JAVA application for more than 15 years and is used by more than 30 research groups around the world. The current state of the Tel-Aviv Metropolitan (TLVM) area MATSim model will be presented, following by a recent study in which MATSim is applied to assess the impact of Dedicated Bus Lanes (DBLs) on urban road traffic.

DBLs have the potential to significantly improve the performance of bus services while encouraging mode switch from private cars to Public Transport (PT), reduce travel times and relieve urban congestion. The DBLs research is focused on the transportation network of the city of Sioux Falls, South Dakota (USA) and the Tel-Aviv Metropolitan area (Israel), where the effects of adding a DBL vs. converting one of the lanes into a DBL is examined. The addition of DBLs results in necessary changes to the PT modal split which reduces the travel times of PT Passengers while preserving travel time of the PT users at off-peak levels.

MATSim's inherent ability to represent individual travelers' adaptation to the changing travel opportunities demonstrates high effectiveness of the DBLs in cities where the level of congestion is high or very high and quantitatively estimates their qualitative effects.

Golan Ben-Dor: I am a PhD student at the geo-simulation lab which is led by Professor Benneson, Tel Aviv University. I am currently researching smart transportation – building, calibrating and validating a Tel Aviv Metropolitan agent-based transport model with a research emphasis on public transport, autonomous shared vehicles in an urban traffic simulation environment.

Crowdsourcing methods for the democratization of urban planning and architecture

Crowdsourcing is an Internet-based information production method used for intellectual challenges like idea generation, problem-solving, classification, quality assurance, and validation. This method shows great potential in the urban and municipal context and it is common to find crowdsourcing applications that collect geographic information and offer new real-time views of the city like traffic and nuisances. The lecture introduces the students to popular crowdsourcing methods and applications. Finally, two innovative crowdsourcing applications will be introduced: Aperire and Meirim (http://aperire.meirim.org).

Jonathan Dortheimer is a PhD candidate at Tel Aviv University, an experienced entrepreneur and Chief Technology Officer with a history of working in the internet industry; server architecture, databases and mobile applications.

New eyes over the city: remote sensing for water sensitive urban design and management
Remote sensing opens new eyes for urban planners: databases from hundreds of urban storm events in diverse locations around the world; revealing of "hidden" connections between land use and urban runoff or between street network density and runoff; developing the capability of "seeing" below ground surface -- the question of penetration versus resolution and the right choice of wavelength. Have we finished studying the basic questions of water in soil? How does water meet the soil and what happens then? How does remote sensing confirm or disapprove our intuitive assumptions? How do we integrate regional data regarding sustainable land use?

Dr. Alon Eliran: In his PhD research, Alon Eliran studied the interaction between rain and irrigation water and the topsoil using an original remote sensing method. Alon is currently involved in various researches of sub-soil sensing. Alon is an urban ecological and community activist in several groups and organisations. He is a team member at CityTree urban ecological community at the centre of Tel Aviv. He has led the TAU ecological community garden and is involved in ecological community based projects at the TAU campus and in bridging between academia and environmentally active people and communities.

Urban Firefighting and Smart Cities
Effective firefighting in urban areas demands sending an effective firefighting force as soon as possible. Doing so poses several challenges: identifying fires, assessing fire severity and type, dispatching suitable teams, coordinating with other authorities, public communications and more. We will survey the considerations and approaches to these topics in the context of smart cities.

Yonatan Shaham is a PhD candidate at Tel Aviv University studying firefighting in urban areas. Yonatan was a senior adviser to Israeli Fire and Rescue Authority since 2011.

Between global centers and local peripheries
My lecture will focus on the growing disparities between the inhabitants of large and global cities, and smaller peripheral localities, which are not only economical but also cultural and political. The lecture is based on a study comparing the lifestyles and residential choices of middle-class households in two Israeli cities – Tel Aviv the country's global center, and Beersheba a peripheral metropolis. I will present differences, between Telavivians in Beershebaians, both in political and familial attitudes, and demonstrate the ways they are shaped by the local characteristics of each city. Characteristics such as relationship to global economy and culture, local housing market, the social landscape of each city, etc. Based on these findings I will look critically at the classic model of center-periphery, their relationship with globalization and ask students to think about the ways local realties play an active role in shaping people's lifestyles, views and identities.

Guy Shani is at the final stages of his PhD in the department of sociology and anthropology, Tel-Aviv University. His dissertation compares between the residential choice process of first time home buyers among middle-class residents of a large global urban center, and of suburban neighborhoods of a mid-size peripheral city.

Startups and industry

Early stage funding in the IoT and Smart City Era.

Noga Kap: Managing Partner, i3 Equity Partners. After 11 years as MD Europe in SunGard, a global software company, she joined Walden Israel, a leading venture capital, as General Partner. For 8 years she led with her partners hundreds of due diligence processes, was instrumental in the investments, and sat in the boards. In 2008 she joined BRM as MD and was responsible for high tech investments. Noga Kap brings over 25 years' experience in the global and Israeli technology arena, with startups and investment bodies. She holds her MBA from Bellvue University in Washington and her BA in Economics and Psychology from Tel Aviv University.

The Challenges of Smart Cities Security and Privacy with Blockchain

Jacob Mendel: Head of research cooperation with the industries at the Tel Aviv University; CTO at the TIG group and Co-Founder of Pellesus and Pelleguard; Former General Manager Cyber Security COE at Intel. Jacob Mendel has been the CEO and Co-Founder of SCsquare Ltd. He holds 16 approved patents in the area of cyber security. His career in cyber security over the past 20 years is a unique mixture of broad practical experience and research expertise. His practice included extensive involvement in cyber security offensive projects, digital rights management, penetration test, reverses engineering and Smart Grid cyber security.

Smart City challenges to stay connected

The city provides numerous challenges that have drastic effect on level of service (signal reception level) a device (smartphone, car, IoT) has; architecture and city planners will have to learn how to consider factors that impact connectivity. Today you need a SIM card for cellular connectivity. With our cloud technology we are able to provide a virtual SIM card and control it, in any given moment. For example, next time you will travel abroad once you land and power up your smartphone we will be able to automatically assign you with a local SIM, without paying the excessive cost of mobile roaming. Another example is with autonomous car, we will be able to switch a driverless car that loses its network connection to a different mobile provider which has service in a specific location.

Eyal Shmueli: Co-Founder, Chief Innovator – Sigmo http://www.simgomobile.com

What is a smart city and how to address the challenging aspects of citizen engagement

What are the challenges for mobility, public safety, environment and citizen engagement? A citizen centricity vision will be presented, as well as solutions and LIVE demonstration. IPgallery offers a holistic yet modular IoT AI/ML Smart City integrative services including city main Command & Control operation dashboard for multiple services (de-silo); One Citizen App for mix and match services; and a Driver App for Smart mobility services in the urban environment. Additionally, we offer IoT platform, real time AI/ML analytics and predictions, sentiment analysis, and solutions for city data ownership and data monetization, for tier-1 vendors and customers worldwide.

Michelle Specktor: Co-founder, EVP Business Development – IPgallery http://www.ipgallery.com

Bibliography

Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart Cities: Definitions, Dimensions, Performance, and Initiatives. *Journal of Urban Technology, 22(1), 3–21.* *doi:10.1080/10630732.2014.942092*

Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M. & Portugali, Y. (2012). Smart Cities of the future. *The European Physical Journal Special Topics, 214(1), 481-518*

Batty, M. (2013) Urban Informatics and Big Data, *Report to the ESRC Cities Expert Group* *http://www.smartcitiesappg.com/wp-content/uploads/2014/10/Urban-Informatics-and-Big-Data.pdf*

Cohen, B. (2012). What exactly is a Smart City?. *Co. Exist, 19.*

Cohen, B. (2015), The Three Generations of Smart Cities, *Co. Exist.* *http://www.fastcoexist.com/3047795/the-3-generations-of-smart-cities*

Goldsmith, S., & Crawford, S. (2014). The Responsive City: Engaging Communities Through Data-Smart Governance. John Wiley & Sons.

Greenfield A. (2013). *Against the smart city*. London, UK: Verso

Haken H., Portugali J. (2017). Smart cities: distributed intelligence or central planning? In Pardalos P.M and Rassia S. (Eds.) *Smart City Networks: Through the Internet of Things*, Springer, Heidelberg.

Humphries, C. (2013). The too-Smart City. *The Boston Globe, 19.*

Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., & Scorrano, F. (2014). Current trends in Smart City initiatives: Some stylised facts. *Cities, 38, 25-36.*

Portugali, J. (2011). *Complexity, Cognition and the City*. Springer Berlin Heidelberg.

Portugali, J. et al Eds. (2012). *Complexity Theories of Cities Have Come of Age*. Springer Berlin Heidelberg.

Shapiro, J. M. (2006). Smart cities: quality of life, productivity, and the growth effects of human capital. *The review of economics and statistics*, *88*(2), 324-335.

Townsend, A. M. (2013). Smart Cities: big data, civic hackers, and the quest for a new utopia. *WW Norton & Company.*