# CEE 177L/277L: "Smarter Cities & Communities"
# Summer 2013

## Course Outline

Half the world's population (and growing) now live in cities; and the top 100 cities account for 25% of the world's GDP. Because they concentrate people and activity, cities concentrate the adverse impacts that mankind is having on the environment, and they also concentrate risk from climatic or seismic events. Yet paradoxically, cities are more resource-efficient and more innovative per capita, and their very concentration provides tremendous leverage if we wish to reverse environmental degradation.

The concept of a "smart city" addresses the use of information technology (IT) to "accentuate the positive, eliminate the negative" in urban life. The "mesh" of data and information through which we understand the world is getting smaller. There are more sensors "out there" (and probably in your pocket and around your house) than ever before. They are reporting ever more frequently. Our ability to analyze this flood of data is also greater than ever before, and only increasing. The result is an unprecedented opportunity to optimize the operations of cities – energy, water, transportation systems, food supply, urban design, resilience and much more.

This course will explore the "smart city", and the IT that underpins it. It will discuss what IT can and cannot do, and most importantly given the privacy implications of many "smarter" IT systems, what it *should* and *should not* do. There are rarely right answers in this field – the course is designed to build awareness of the potential for IT to improve the interactions between mankind in cities and the planet, and encourage students to think: the course will be successful if you leave with more questions than you started with!

No prior knowledge of IT is required, but you will benefit from an interest in the application of information and IT to social and business issues.

The course is structured as 8 x 2.5 hour modules:

*1)* June 24th: *Smarter Cities in Concept:* what is a smarter city and how would you know if you were living in one? How can the idea of a smarter city help the planet?

*2)* July 1st: *The New Informatics Toolkit (Part 1):* discusses the methodological and technological innovations within organization design and IT that are enabling the creation of new sensing, data aggregation, analytic/optimization and visualization technologies. This module also discusses current gaps in our technological capabilities and how they might be filled.

*3)* July 8th: *The New Informatics Toolkit (Part 2):* (continues the discussion in Module 2).

*4)* July 15th: *Deep Dive – Water Management:* explores the application of the new informatics toolkit specifically to the management of water resources, and water and waste-water infrastructures.

*5)* July 22nd: *Deep Dive – Transportation:* explores the application of the new informatics toolkit specifically to transportation systems.

*6)* July 29th*: Deep Dive – Citizen Sensing and Open Data:* explores the growing role of citizen sensing activity and the open data movement in transforming the way that cities operate.

*7)* August 5th: *Deep Dive – Resilience*: explores the use of IT to make cities better able to withstand both chronic stresses such as ongoing pollution, and acute stresses such as floods, heat events and earthquakes.

*8)* August 12th: *"Yes, but…":* the application of IT in the areas described presents challenging issues of technology risk management, citizen acceptance, privacy and security. This module explores those issues and summarizes the rest of the course.

## Course Methods and Logistics

This is a 2 or 3 unit course (as you require), graded by Letter or Credit/No Credit.

We will require the submission of two papers or posters (your choice) for two units and three for three units, on topics to be determined. Where letter-graded, papers/posters will be graded as follows:

A. Adds insight – or even just questions and open issues - to the existing "state of the art"
B. Demonstrates understanding and insight on a par with the "state of the art".
C. Not wrong, but not earthshaking either!
D. Either trivial or demonstrates a specific lack of understanding.

Extensive time will be allowed for discussion. Some pre-reading will be set for some modules (see below); and students will be asked to think in advance about issues to be discussed. At all times, students will be encouraged to supply examples of their own of the issues and solutions being discussed on the course.

The course will run every Monday on the dates above, from 5.45 - 7.15pm. Classes will take place in Y2E2 Room 111.

Module 5 will be delivered by an external speaker.

## Pre-reading.

This is a very wide-ranging overview type of course that synthesizes multiple sources and ideas: there are no references that cover all of it. Here is a selection of some pre-course reading. The items in bold will deliver most value for time spent. ☺

"Business Dynamics: Systems Thinking and Modeling for a Complex World," Sterman, J, Irwin/McGraw-Hill, 2000.

"Pricing the Planet", P Bisson, E Stephenson & P Viguerie, McKinsey Quarterly, June 2010.

"The Value of the world's ecosystem services and natural capital", Costanza et al, Nature, 387, 253-260, 15 May 1997.

**"Thinking in Systems: A Primer" by Donella H. Meadows, Chelsea Green, 2008**

"Sensor Technologies for a Smart Transmission System" – EPRI white paper, December 2009. Available from:
http://www.smartgridnews.com/artman/uploads/1/1020619SensorsSmartTransmission1-2010_1_.pdf

**Google "citizen sensing" and "crowd-sourcing data" and follow wherever the trails lead…**

"A Strategy For Federal Science And Technology To Support Water Availability And Quality In The United States, - Report Of The National Science And Technology Council Committee On Environment And Natural Resources Subcommittee on Water Availability and Quality", NSTC, September 2007.

**"Foundations for Smarter Cities", C. Harrison, B. Eckman, R. Hamilton, P. Hartswick, J. Kalagnanam, J. Paraszczak and P. Williams, IBM Journal of Research and Development, Vol 54, No 4, July/August 2010. Available from http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5512826**

"Smart Cities": Transforming the 21st century city via the creative use of technology", V Buscher, L Doody, D Hill; Arup, 2010

**"Informed and Interconnected: A Manifesto for Smarter Cities" "R Moss Kanter, S. Litow, Harvard Working Paper 09-141, 2009. Available from http://www.hbs.edu/research/pdf/09-141.pdf**

## About Me

I am the Chief Technology Officer of IBM's environmental business activity, "Big Green Innovations", and in 2009 had the honor of being appointed an IBM Distinguished Engineer. I have been heavily involved with the creation of IBM's product and service offerings in greenhouse gas management, water management, resilience and the company's activities in the area of "smarter cities". By background, I am a management consultant with 25 years' experience of applying IT to leading edge business and social issues. My PhD was in Management but focused on politics, gained from the University of Bath, England.

Although I work for IBM, I intend to draw on the activities of multiple vendors for the course.

I look forward to meeting you on the Smarter Cities course!

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