

# EM/SSW 599: Introduction to Smart Cities and their Ecosystems (3 Credits)

Fall 2022 | In-person Class | North Building Room 102

## Instructor Information

### Instructor

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### Email

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### Office Location & Hours

208 North Building;

## General Information

### Description

This course introduces Smart Cities at conceptual, technological, and social levels. Its aim is to develop an understanding of the concept of a city and the concomitant needs of the citizens and of the city management to make the city smarter and explore how this can be accomplished both from a social and technical level. It also will relate Smart Cities to smart homes, neighborhoods, and campuses.

### Course Objectives

Understanding the technical and socio-technical basis of a smart city requires understanding the concept of a city and the needs of its citizens and administration. The course will review the history of the Smart City, explore its architecture, its developing ecosystems, and its technical basis from individual sensors to large scale information systems. Additionally, it will explore possible futures with an emphasis on emerging technologies and trends (e.g., citizen science). The course will emphasize a project-oriented approach. Students will gain experience analyzing data from smart city data sources ranging from electricity consumption, to water, and mobility. At the end of the course, students will be expected to write a conference paper that advances an area of interest within the smart city context.

### Course Outcomes

- Understand the strengths and weaknesses of Smart City architectures and Technology  
**SES Outcome 2 Scientific Foundations** - an understanding of the scientific and mathematical basis of engineering (ABET Criterion 3-a).
- Apply this understanding to evaluate a specific Smart City case study.  
**SES Outcome 2 Engineering Foundations** - the ability to use applied scientific knowledge (ABET Criterion 3-b, 3-e).
- Demonstrate how the technical and socio-technical aspects of a Smart City meets the current and future smart needs of its citizens and administration.  
**SES Outcome 2 Design Assessment** - the ability to develop and assess alternative designs based on technical and non-technical criteria (ABET Criterion 3-e).

### Prerequisites

None

## Grading Breakdown

Homework: 10%

Midterm Exam: 15%

Final Exam: 25%

Course Paper 50%

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## Graduate Credit counts towards Degree or Certificate

Yes

## Reference Textbook

[GC] **The Responsive City: Engaging communities through Data-Smart Governance**

S.Goldsmith and S. Crawford, Jossey-Bass, 2014. ISBN10: 1118910907;

[K] **Ubiquitous Computing Fundamentals**

John Krumm (ed) CRC Press, 2010. ISBN10 1420093606;

## Course Schedule

Week	Topic	Reading	Discussion
Week 1	<b>Introduction:</b> explores the challenges facing urban environments, the system of systems that comprise a city, frames the attributes of a smart city, and introduces the key enablers of a smart city	<a href="#">[GC] Intro + Chap 1</a> <a href="#">Reading #1</a>	What is a smart city? Who are the principal stakeholders? What are the major inhibitors/challenges?
Week 2	<b>Digital Infrastructure of Smart Cities:</b> explores the infrastructure required to enable a smart city: instrumentation & sensors, connectivity, the IoT platform, cloud/edge computing, and blockchain.	<a href="#">Blockchain</a> <a href="#">IoT</a>	How to deploy the enabling infrastructure effectively with minimal cost/disruption and maximum flexibility?
Week 3	<b>IT and Smart Cities:</b> explores the technical innovations in IT that are enabling the creation of new data aggregation, analytic and visualization technologies. Focus on the evolving range of analytical tools and the rise of cognitive systems.	<a href="#">Open Data guide</a> <a href="#">Citizen science</a>	Data Challenges - access, integration, security, ownership, standards. Does 'open' data necessarily mean 'free' data?
Week 4	<b>Smart Communities:</b> explores how smart city concepts can be applied to a village, military installation, remote neighborhood. Explore campus environments as cities in microcosm	<a href="#">Smart Communities</a> <a href="#">Connected Community</a>	How scalable are the enabling technologies? What access to technology can be assumed? What advantages do villages or universities have over large cities?
Week 5	<b>Mobility, Logistics, Energy &amp; Live-Work:</b> Use data to understand the most efficient and sustainable ways for people to move around, live and work in cities.	<a href="#">Energy</a> <a href="#">Mobility</a>	How can transport infrastructure be optimized? What will the modal mix look like in a smart city? Benefits & risks of automation in transportation.

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Week	Topic	Reading	Discussion
Week 6	<b>Policy, Governance, &amp; Partnerships</b> explores the non-technical elements of smart city solutions- procuring for innovation, keys to successful Public Private Partnerships, funding mechanisms, achieving stakeholders buy-in, overcoming skills & organizational issues.	<a href="#">Government</a>	How do we pay for all of this and do we have the right skills?
Week 7	<b>Smart Buildings:</b> explores converged physical/digital structures that respond to & anticipate the needs/actions of occupants and are aware of the environment around them.	<a href="#">Digital Twins</a>	What attributes - beyond energy & water efficiency - should smart buildings aspire to? How do we align costs with benefits?
Week 8	<b>Midterm</b>		
Week 9	<b>Case Study: Hoboken</b>		
Week 10	<b>Cities Without</b>		
Week 11	Paper Presentations		
Week 12	Paper Presentations		
Week 13	Course review		Final Exam

#### Reading NOTES:

- These are particularly long readings, but excellent reference materials. The expectation is that students only skim through them - not read the entire document.
- Students are encouraged to explore the web for additional information beyond the recommended readings.
- Additional sources will be recommended in each lecture and listed in references at end of each presentation.