Carnegie Mellon University

H. John Heinz III College

Fall 2015 Mini II: 94-845

Smart Cities: Growth with Intelligent Transportation Systems

Lecture: Tuesday, 6pm–8:50pm, HBH 1004

Instructors:

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Office hours: Thursdays noon-1:00pm

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Adjunct Associate Professor, H. John Heinz III College

Grading

Your course grade will be based on the following team and individual activities and weights:

Team:

Final Project 50%

Individual:

Five Weekly Reflections (Due on Monday by Midnight) 40%

Class Participation 10%

Total: 100%
Course Context

Cities all around the world are being built and re-invented as smart cities utilizing information systems and innovative applications of data analytics. One major smart cities component is transportation. The Intelligent Transportation Systems (ITS) industry is expected to grow at a rate of 19% per year and reach $5.5 Billion in annual investment by 2020. This shifting dynamic provides great opportunity for improved transportation safety and efficiency but also poses challenging information systems and public policy challenges. Furthermore, there are new opportunities for professional-school graduates outside of engineering schools for employment in transportation planning and policy.

This course is supported by CMU’s Traffic21 Initiative and Technologies for Safe and Efficient Transportation (T-SET) University Transportation Center. Classes will feature guest lectures provided by T-SET faculty and industry and government ITS professionals.

Course Objectives

- Develop an understanding of the underlying dynamics of the smart cities trend and how ITS is integrated. Smart Cities components in addition to transportation include; energy systems, health and human services, education, water and sewer infrastructure, public safety, etc.

- Develop an understanding of the various components of ITS. Examples of ITS components included; autonomous and connected vehicle technology in vehicles and between infrastructure and vehicles, real-time sensing of infrastructure, artificial intelligence to analyze data, information dissemination, etc.

- Develop an understanding of the various applications/systems of ITS on the local, state, national and international levels. Examples of ITS applications include: advanced traffic control system, automatic road enforcement (variable speed limits, electric toll collection), intelligent public transportation system, transportation demand management, intelligent parking management system, multi-modal traveler information systems, etc.

- Synthesize and analyze ITS policy and understand the technology challenges. Examples of current technology challenges include inadequacy of GPS positioning distribution of safety certificates. Policy challenges include; privacy, liability, tax equity, social acceptance of technology, etc.

- Develop hands on experience of ITS concepts by applying them to scenarios such as the City of Pittsburgh’s smart transportation plans.
Course Format

Each of the class meetings will focus on a particular topic of ITS. To pursue the course objectives most effectively you will be asked to accomplish the following:
1) Read the assigned article(s) or technical report(s) in advance,
2) Attend guest lectures provided by the instructors, T-SET faculty and industry and government ITS professionals,
3) Participate in the discussion for ITS issues and case studies,
4) Prepare weekly reflections after each class and turn in by Monday midnight,
5) Hand in a final project report and present your project in the end of the course.

Textbook

There is no textbook for this course. Materials will be posted on Blackboard as needed.

Blackboard

Blackboard organizes this course. All course materials will be posted to Blackboard (www.cmu.edu/blackboard)

Final Project

Because we are convinced that you can learn a great deal in this course by working with your fellow students, you are encouraged to work in teams of two or three.

Your group may choose to do an in-depth project on any of the above applications. Your group may also develop your own project. The project is to be presented during the last week of classes. A project report is to be submitted by Dec 06. The project must include both technical and policy components. Please work closely with the instructors to develop your project ideas.

Possible project topics include, but are not limited to:
- A critical review of an ITS application with proposed future research framework
- Cost/benefit analysis of an ITS component or application
- A state-of-the-art review of an ITS component or application
- How can ITS be implemented to achieve sustainable mobility?
- How can ITS help to manage transportation demand efficiently (e.g., congestion pricing, parking pricing)?
• How does ITS affect the long-term land-use development, urbanization or transit-oriented development?
• ITS Data analytics
• ITS in developing countries

COURSE CALENDAR

MODULE 1: Why Smart Cities, Why Now?

10/27 Course overview, Smart Cities overview (6:00-6:20)
Guest lecture and Q&A (6:25- 7:30)
Discussions: Smart cities (7:40-8:20)
Introduction to intelligent sensing (8:25-8:50)

- Guest Speaker : Don Carter (CMU)

MODULE 2: Technology in ITS

11/03 Intelligent sensing

Guest lecture and Q&A (6:00- 7:10)
Lecture: Intelligent sensing (7:20-7:55)
Discussions: Opportunities and challenges of smart sensing (8:00-8:30)
Introduction to connected vehicles (8:35-8:50)

- Guest Speaker : Christoph Mertz (CMU)

11/10 Autonomous and Connected Vehicles, applications of V2I and V2V

Lecture: Connected automated vehicles (6:00- 7:30)
Discussions: The future of autonomous vehicles (7:40-8:30)
Introduction to demand management (8:35-8:50)

MODULE 3: Applications of ITS that bring intelligence to the travelers and managers

11/17 Travel Demand Management

Guest lecture and Q&A (6:00- 7:10)
Lecture: Travel Demand Management (7:20-7:55)
Discussions: ITS and demand management (8:00-8:30)
Introduction to Traveler Information Systems (8:35-8:50)
- Guest Speaker: Naveen Lamba (CH2M Hill)

11/24  Traveler Information Systems

Guest lecture and Q&A (6:00- 7:10)
Lecture: Traveler Information Systems (7:20- 8:00)
Discussions: Travel behavior and Traveler Information Systems (8:00-8:30)
Introduction to traffic control systems (8:35-8:50)

- Guest Speaker: Amber Reimnitz (PTC)

12/01  Adaptive Traffic Signalization

Guest lecture and Q&A (6:00- 7:10)
Lecture: Traffic control systems (7:20-7:55)
Discussions: Travel behavior and Traffic control systems (8:00-8:30)
Final project Q&A (8:30-8:50)

- Guest Speaker: Steve Smith (CMU)

**MODULE 4: Project presentations**

12/08  Term project presentations (6:00-8:50)

12/11  Term project report due midnight