A. COURSE DESCRIPTION

The world is rapidly urbanizing. More and more cities in Asia and around the world are becoming increasingly popular as economic powerhouses and magnets for rural migrants. All big cities in both First and Third World countries such as New York, London, Tokyo, Paris, Shanghai, Hong Kong, Singapore, New Dehli, Jakarta etc. have to cope with high population density and serious challenges such as air pollution, traffic congestion or waste management. How do we pack more people into big cities and yet continue to achieve a high quality of life? How do we create and manage ‘good cities’ which are safe, spacious, green, connected, fair and resilient? How can cities create economic wealth while still fulfilling the CSR responsibilities of sustaining a “Green Planet”? What are the best practice designs and technical ‘smart city’ solutions which could be leveraged to tackle these challenges and how can they be successfully commercialised? This course will provide answers to these questions with special emphasis on the managerial and commercial aspects of smart city concepts.

The key lies in creating and effectively managing innovative and sustainable (“smart”) cities able to leverage on new technologies such as smart grids or sensor networks to create a place where people can live, play and work well. Starting from the stakeholder requirements of citizens and planners of innovative cities, the course will introduce students to urban design concepts as well as commercialization, management challenges and implementation issues of the smart city model. There will also be a focus on how good governance and enabling technologies such as IoT (Internet of Things) can facilitate the creation, management and sustainability of ‘good’ cities in Asia and beyond.

With the help of case studies and resource persons such as industry leaders, innovative city designers, tech experts and business development experts from local and int. companies such as Siemens or the Urban Redevelopment Authority (URA), students will be familiarized with the opportunities and challenges of the ‘smart city business’ with special reference to Singapore’s ‘Smart Nation’ strategy. Local site visits to ‘smart’ urban components in Singapore will complement the learning experience.
B. LEARNING OBJECTIVES

The overall objective of this module is to equip students with core knowledge of appreciating what it takes to plan, design, build and sustain (mega) cities that are innovative and sustainable and to know the challenges of successfully ‘selling’ new smart city concepts amidst increasing competition in this field.

By the end of this course, students will be able to appreciate the following 4 areas:

Taxonomy of Innovative & Sustainable Cities
- Describe the core characteristics of a Smart City and respective concepts
- Explain the unique characteristics of each component and how it adds value to innovative and sustainable (smart) cities

Design of Innovative & Sustainable Cities
- Understand the planning and design principles of Innovative & Sustainable Cities
- Explain the workings of each component of Innovative & Sustainable Cities

In-depth study of selected (Mega) Cities
- Be familiar with the challenges of selected mega cities around the globe and understand how the smart city concept can add value in terms of livability

Commercialisation of the Smart City Concept
- Appreciate the challenges in successfully commercializing smart city concepts and applications based on local and international (good practice) examples
- Know some of the key players in the Singapore context which are involved in this service sector and establish network contacts

C. PRE-REQUISITES / REQUIREMENTS / MUTUALLY EXCLUSIVE COURSES (IF ANY)

This course does not require any pre-requisite.

D. ASSESSMENT METHODS / GRADING DETAILS

Cumulative assessment (CA) constitutes 100% of the final grade, consisting of:

<table>
<thead>
<tr>
<th>1. Individual Assessment: 40% of total, consisting of</th>
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<tbody>
<tr>
<td>Class Participation</td>
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<tr>
<td>Term Paper</td>
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<th>2. Group Assessment: 60% of total, consisting of</th>
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<tr>
<td>Minor Group Project #1 (Field Trip)</td>
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<tr>
<td>Major Group Project #2</td>
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<td><strong>Total</strong></td>
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E. ACADEMIC INTEGRITY

All acts of academic dishonesty (including, but not limited to, plagiarism, cheating, fabrication, facilitation of acts of academic dishonesty by others, unauthorized possession of exam questions, or tampering with the academic work of other students) are serious offences.
All work (whether oral or written) submitted for purposes of assessment must be the student’s own work. Penalties for violation of the policy range from zero marks for the component assessment to expulsion, depending on the nature of the offense.

When in doubt, students should consult the instructors of the course. Details on the SMU Code of Academic Integrity may be accessed at http://www.smuscd.org/resources.html.

F. ACCESSIBILITY

SMU strives to make learning experiences accessible for all. If students anticipate or experience physical or academic barriers due to disability, please let the instructor know immediately. Students are also welcome to contact the university’s disability services team if they have questions or concerns about academic provisions: included@smu.edu.sg.

Please be aware that the accessible tables in the seminar room should remain available for students who require them.

G. INSTRUCTIONAL METHODS AND EXPECTATIONS

The course approach is based on both analytical rigor and the practical utilisation of Smart City principles and concepts. During the course, a variety of teaching and learning techniques will be employed to enable students to think critically and imaginatively about the various implications of the topic.

Individual Assessments

Class Participation: Students are encouraged to ask questions and offer your opinions in class. Active and well-thought-through discussions are expected from all students. The Rubrics for class participation is in Annex B.

Term Paper: Each student will be assigned one smart city topic. You have to do thorough research on the topic and produce a paper of between 1800 and 2000 words. If you are unsure how to structure the term paper, as a guide, you can use the Who, What, When, Where, Why, and How format to organize your term paper. Citations are to be in APA format.

Please refer to a separate file in eLearn for the allocation of Term Paper topics.

Group Projects

Students will work on two group projects. Each project group will comprise 5-6 students; you can form your own groups.

Group Project #1: Please refer to Annex A for the Scope of Group Project #1 (Field Trip).

Group Project #2: Each group will be assigned one of the following topics to do research in.

1. Songdo
2. Tokyo
3. Copenhagen
4. London
5. Boston
6. Paris
Spare topic: Singapore
This Group project involves the deep study into the allocated topic, with special reference to the smart city concepts using the EU Smart Cities framework as a guide. [www.smart-cities.eu/model.html](http://www.smart-cities.eu/model.html)

No report is required. Each team is required to do a 20-minute presentation in class during Session 12. Softcopy of PowerPoint slides is to be submitted via eLearn before the presentation.

**H. CLASSROOM POLICIES**

The course is taught in three 3-hour sessions per week; total of 12 sessions.

A high level of student participation is required both in the classroom and in the assignments. Students are required to read widely and to participate actively in projects, presentations, team discussions and in-class discussions. A key assumption is that knowledge is constructed by learners and not merely absorbed from textbooks and people with more experience.

**I. IMPORTANT ASSIGNMENT DATES**

1. Group Project #1: Lesson 7
2. Term Paper: Lesson 9
3. Group Project #2: Lesson 12

**J. CONSULTATIONS**

Consultations hours with the lecturer(s) will be via appointment to be made via email. Please contact co-Instructor, Kan Siew Ning, if you have questions.

**K. RECOMMENDED TEXT / READING LIST / CASE STUDIES LIST**

**Main Textbook:**

**Introductory Readings:**

http://www.forrester.com/pimages/rws/reprints/document/82981/oid/1-LTEQ9N

**Additional Readings:**
Additional readings from various sources will be assigned for each class session.

**Useful Links**
The following links may be useful to students doing research for this module.

- [http://cities.media.mit.edu/](http://cities.media.mit.edu/)
<table>
<thead>
<tr>
<th>LESSONS</th>
<th>SESSIONS</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>LESSON 1</td>
<td><strong>INTRODUCTION: SINGAPORE THEN AND NOW</strong></td>
<td>Thomas</td>
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<tr>
<td>(Tue, 30 June)</td>
<td>- Towards Asia’s Leading Knowledge and Innovation (‘Smart’) City</td>
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<td></td>
<td>- What Makes a City ‘Smart’?</td>
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<td>- Prosperity through Good (Knowledge) Governance</td>
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<td></td>
<td>- Challenges Ahead</td>
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<td>- Course overview &amp; learning objectives</td>
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<td>- Course Outline Specifics and Deliverables</td>
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<tr>
<td>LESSON 2</td>
<td><strong>TAXONOMY OF INNOVATIVE &amp; SUSTAINABLE CITIES</strong></td>
<td>Siew Ning</td>
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<tr>
<td>(Wed, 1 July)</td>
<td>- What is a Smart City? Mega City vs. Smart City</td>
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<td></td>
<td>- Frameworks and rankings of smart cities</td>
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<td></td>
<td><strong>URBAN PLANNING</strong></td>
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<tr>
<td></td>
<td>- What is urban planning?</td>
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<td></td>
<td>- Why is it important?</td>
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<td></td>
<td>- Examples of good urban planning and tools used</td>
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<td></td>
<td>- The role of urban planning in smart city governance</td>
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<td>LESSON 3</td>
<td><strong>FIELD TRIP: VISIT OF MARINA BARRAGE: SINGAPORE’S WATER STORY</strong></td>
<td>Thomas</td>
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<td>(Thu, 2 July)</td>
<td>- Singapore’s water needs, PUB and the role of Marina Barrage (a dam built across the 350-metre wide Marina Channel to keep out seawater)</td>
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<td></td>
<td>- WaterHub Singapore</td>
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<td></td>
<td>- The Sustainable Singapore Blueprint: Singapore’s national vision and plans for a more liveable and sustainable city:</td>
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<td></td>
<td>- A Liveable and Endearing Home</td>
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<td>- A Vibrant and Sustainable City</td>
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<td>- An Active and Gracious Community</td>
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<tr>
<td>LESSON 4</td>
<td><strong>MAKING A SMART CITY WORK THROUGH (‘GOOD’) GOVERNANCE AND (ROBUST) ECONOMIC CLUSTERS</strong></td>
<td>Thomas</td>
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<tr>
<td>(Tue, 7 July)</td>
<td>- Smart urban leadership, governance and innovation</td>
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<td>- Role of knowledge clusters and knowledge hubs</td>
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<td></td>
<td>- Case study: Offshore Marine Cluster</td>
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<td></td>
<td>- Commercialising innovative smart city concepts</td>
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| LESSON 5  (Wed, 8 July) | **SMART R&D MANAGEMENT**  
- Science & technology parks  
- R&D ecosystems & case studies (e.g. Silicon Valley)  

**SMART ENERGY MANAGEMENT**  
- Importance of ‘good’ energy saving habits and renewable energy sources for a sustainable (urban) future  
- Status of solar photovoltaic systems in Singapore  
  - How smart energy start-ups could disrupt the current structure of Singapore’s electricity market  

**DRONES FOR SMART CITIES**  
- Impact of UAVs (drones) on business, militarization, urbanization, labor markets etc.  
- The drone business – Drones for smart cities  

| LESSON 6  (Thu, 9 July) | **Group Project #1 (field trip)**  
(*There will be no class for this session. Students are given time to do the Group Project #1. Your group can use this time to do any of the pre-visit, visit and post-visit activities.**)  

| LESSON 7  (Tue, 14 July) | **DUE DATE FOR GROUP PROJECT #1 (FIELD TRIP PRESENTATION)**  
(All groups to present in class; 20 min per presentation)  

| LESSON 8  (Wed, 15 July) | **FIELD TRIP: 9AM – 10.30AM**  
**VISIT OF METEOROLOGICAL SERVICE SINGAPORE**  
- ‘Introduction to the Science of Climate Change’ by Dr Muhammad Eeqmal Hassim, Senior Research Scientist at CCRS  
- Short tour of MSS’ Central Forecast Office  

|  |  
| Siew Ning | Thomas |
### LESSON 9
(Thu, 16 July)

**DUE DATE FOR INDIVIDUAL ASSIGNMENT (TERM PAPER)**

**FIELD TRIP: 9.45AM**
**VISIT TO URBAN REDEVELOPMENT AUTHORITY (URA)**
- Introduction to URA’s 3D planning approach used to make its urban development and design efforts faster and more accurate
  

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### LESSON 10
(Tue, 21 July)

**SMART MOBILITY – OVERVIEW & LAND TRANSPORT**
- Teleworking: role of ICT as enabler of smart mobility
- Categories of land transportation
- Policy issues related to public transport
- Driverless cars
- Road planning & design
- Road traffic management

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### LESSON 11
(Wed, 22 July)

**SMART LIVING: INTELLIGENT BUILDINGS**
- What makes a building “smart”?
- Residential buildings
- Commercial office buildings
- Underground buildings
- How can buildings become more intelligent?

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### LESSON 12
(Thu, 23 July)

**DUE DATE FOR GROUP PROJECT #2**

(All groups to present in class; 20 min per presentation)