National Research University - Higher School of Economics
HSE Graduate School of Urbanism

Master Program

PROTOTYPING FUTURE CITIES

CITY AND TECHNOLOGIES

Semester 1 (Sept 2017 – Feb 2018)

Moscow, 2017

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WELCOME LETTER

Dear students,

welcome to the Prototyping Future Cities master's degree program!

If there is place with a tradition with Prototyping Future Cities, this is Moscow. It's a City where many technological innovations have been produced during XX century and where many innovations related to social housing and green spaces have happened. Now, the HSE Graduate School of Urbanism has launched a new Master program 'Prototyping Future Cities' to educate the leaders for the construction of urban environments.

During the program you will learn how to develop prototype projects applicable at any urban aspect, starting with the capacity to analyse data, to integrate appropriate technology and to design proposals that will change the current reality. The prototype projects will also include the proposal of an economical model.

Project = Analysis + Technology + Design + Fabrication + Implementation

The program takes place in the Shukhov Lab for prototyping future cities which is the one of the FAB LAB network laboratories. You will work very closely with technology, preparing prototypes, investigating and analysing the city through data, while developing projects that come as a relevant response to the particular problems that affect the city. In the end, you will have skills developed by the various areas of study. Thus you will be able to tackle any kind of project. To achieve this, you will have to work both individually, in order to further develop your own skills, but also in collaborative group projects, either remotely or physically, with other universities or cities in which the Master program 'Prototyping Future Cities' is active.

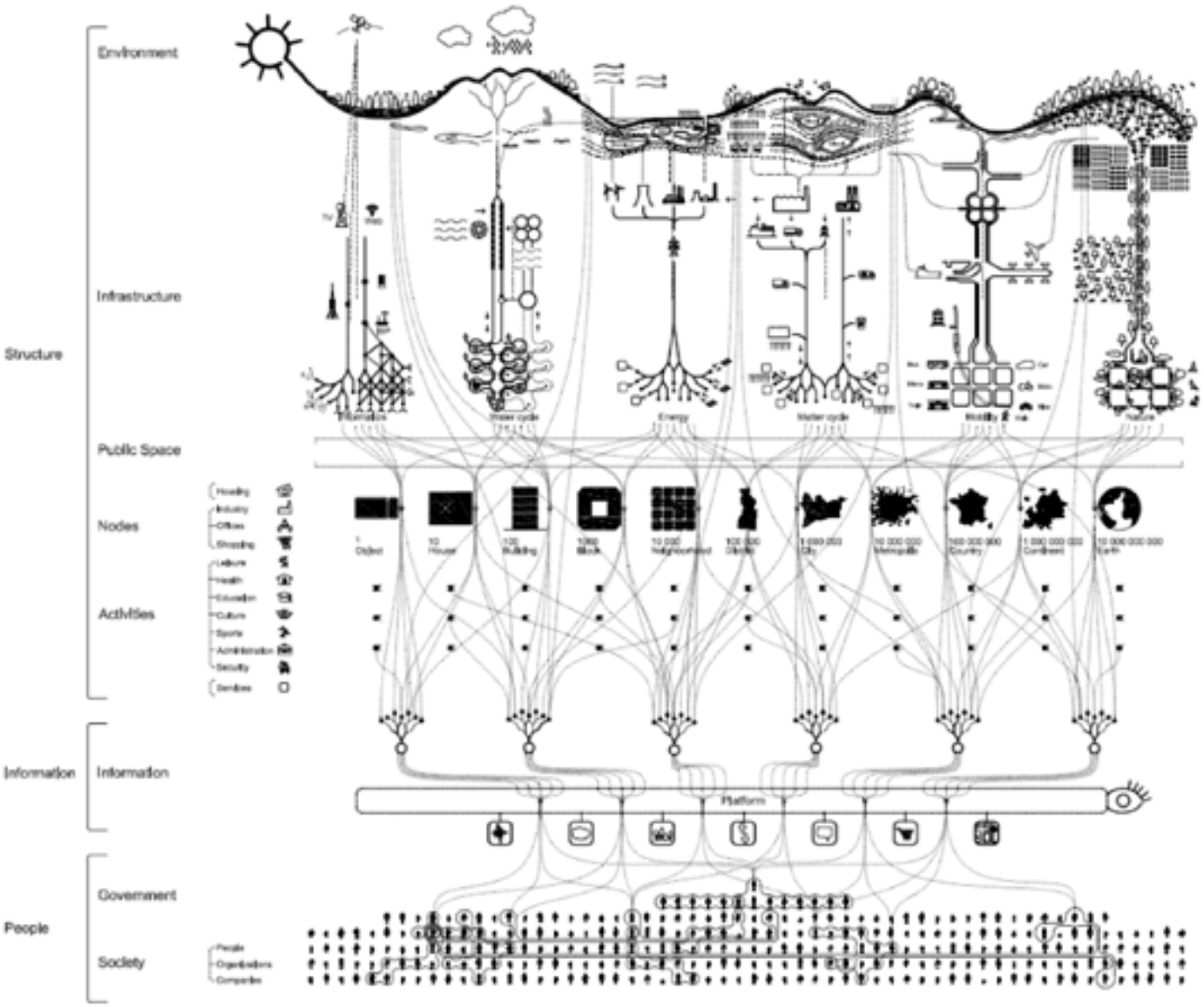
We look forward to supporting your academic and personal success at Higher School of Economics!

Welcome!

Sincerely yours,

Vicente Guallart

CITY PROTOCOL



TUTORS

Andrey Yelbaev

- MA in Architecture and Digital Media: University of Westminster
- Bachelor of Architecture: Novosibirsk State Academy of Architecture and Fine Art

Nadia Khort

- Master in Urban Planning: Graduate School of Urbanism, National Research University - Higher School of Economics
- Bachelor in Cultural Studies: School of Cultural Studies, National Research University - Higher School of Economics
- Coordinator, Laboratory for Experimental Urban Design GSU

Sofia Gavrilova

- PhD student in Oxford
- School of Geography and the Environment
- PhD in Cartography
- Moscow State University Master in Photography
- Rodchenko Art School of Photography and Media Studies
- Co-founder of 'Department of research Arts'
- Project leading researcher in the NGO 'Memorial-Russia' (project 'Topography of terror')

Andrey Ptitsyn

- graduate of Fulbright Faculty Development program
- assistant professor at Moscow State University, SUNY Canton (USA), University of Pittsburgh (USA), Xing Wei College (China)
- Deputy Director of Synesis
- participant of Skolkovo project

Ivan Mitrofanov

- Fab Academy
- Intern: Green FabLab Barcelona
- MISiS Faculty, Electronics & Coding tutor at FabLab Moscow
- Digital Fabrication master at FabLab Moscow

CITY PROJECT: THINGS

Andrey Elbaev, MA

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Moscow, 2017

CITY PROJECT: THINGS

'City Project: Things' is the first module of larger City Project course. The aim of this course is to teach students design and production of objects and spaces utilising digital technologies to add new capacities to the traditional built environment. Each semester the scale of the projects will increase, starting from from domestic things, to entire buildings and later communities and cities. Thus, within the "City Project: Things" module, students will learn how to use technology to document, analyse and reinvent processes and objects at interior scale. At the end of the module students will produce their first full-scale prototype.

Students will work on the scale of an interior object and investigate new relationships between space, its limits, the objects it contains, the networks that connect things with spaces and people who inhabit it.

The project will begin with the analysis of the selected space or process using various media and data. Then students will make a design proposal and produce a prototype of an object that will be built in the laboratory and, subsequently, will be implemented into the real environment and tested by real users.

LEARNING OBJECTIVES

- to introduce students from different background to laboratory based study, to student centred, self-motivated "learning by doing" approach
- to develop students' skills in planning and prototyping projects for interior spaces in which new digital technologies play a key role
- to allow students to reflect on the environment in which we live and to prompt analysis of how it can be improved through the projects
- to teach students how to develop design concepts and prototype them at full scale in technological and collaborative environment
- to teach students how to test the prototypes with real users and get their feedback to improve usability
- to teach students how to document and present their work using contemporary media and technology
- to inform students on how and where their projects can be presented to the public.

LEARNING OUTCOMES

- students will be able to identify design problems using their subjective experience as a tool
- students will know key technologies available to solve design problems
- students will understand opportunities and limitation of various technologies used in industrial and interior design
- students will be able to do a benchmark of their design concepts
- students will acquire general technological skills to produce full scale prototypes to proof their concepts
- students will understand how to scale up their proposal in the world of ubiquitous computing and networks

COURSE PLAN

№	Theme	Total hours	Lectures	Seminars	Practical / Field trip	Indi-vidual work
1.	Introduction to City Project: Connected Things. Course structure, learning method, deliverables	2	2			
2.	Sentient city where every THING matters	2	2			
3.	Recording daily routing	8	1	2	1	4
4.	When things are connected	2	2			
5.	Rediscovering a domestic object	8	1	2	1	4
6.	Abstract modelling - identifying the essence	8	1	2	1	4
7.	Weaknesses and opportunities: understanding how to add value with technologies	8	2	1	4 (visiting an office, that work with tech. object)	1
8.	Drafting design proposal	4	1	2	1	
9.	Benchmarking similar projects	4	1	2	1	
10.	Prototyping	24	2	5	6	11
11.	Telling a story	8	1	2	2	3
		78	**16**	**18**	**17**	**27**

COURSE CONTENT AND READING LIST

1. Introduction to City Project: Connected Things. Course structure, learning method, deliverables

Introductory lecture on the course and its approach to learning process. Highlights the difference between typical lecture based courses and laboratory based courses. Emphasises the importance of self-motivated study and exploration to perform well on the course. Outlines course structure, its main themes, tasks and schedule. Explains tutor's role and how the course is connected to other modules in the programme.

Shows what is expected from students as final result. Finally, stresses the level of expectation: not only students should produce working prototypes, they also need to document every stage of the process and produce a report. At the end of the lecture example projects at the interior scale will be shown and discussed with the students.

2. Sentient city where every THING matters

This lecture introduces students to the vision of a city as a network of things that is now capable to sense, record, process, transmit, and respond to information and activity taking place within and around them. It provides historical context for that phenomena, explains what technological changes are allowing that to be happening.

It elaborates the differences between state of art innovation and affordable consumer products and puts that into perspective. It suggests the range of opportunities to use technological advancements to add value in people's everyday experience

3. Recording daily routing

This theme consists of small briefing lecture, individual task and debriefing session upon completion of the task. During the lecture, some of the basic methods of recording behaviour and collecting data will be presented. Students will be introduced to the Quantified Self movement, to the annual reports by Nicholas Felton, research of Deb Roy and others. Students will also be provided with general understanding how to analyse and interpret data, how to turn it into knowledge.

Personal task for students would be to quantify their daily routing, to collect data describing their patterns of everyday life. What to record exactly and how to do it won't be specified. It is up to students' preferences, opportunities and skills to decide. By the end of two weeks period of recording, students should produce small reports with gathered data, its analysis and conclusions. Then a debriefing session will take place, where the initial purpose of that task will be discussed. The concept of overcoming habituation to reveal problems will be elaborated.

> Course descrirption

4. When things are connected

This lecture will continue exploring contemporary urban conditions and the role of things that now not only is capable of sensing, but also connected to the Internet. The concept of the Internet of things and cloud computing will be explained. Examples of connected things will be provided. Hopes and fears of proliferation of the Internet of things will be discussed.

5. Reverse engineering an object

This theme consists of small briefing lecture, individual task and a review seminar.
During the briefing section, students will be asked to choose a domestic object, study it and perform reverse engineering session. Following question should be answered. What is its function? How people interact with it? What processes are happening inside that object? Identify components that the object is consists of, how those components contribute to the hole? What is the genesis of that object?
The exercise will boost students' confidence in working with full-scale objects and teach them how to critically evaluate design solutions.

6. Abstract modelling and simulation

This theme consists of briefing, individual task and a review seminar.
During that theme, students will be asked to produce an abstract model of chosen object or process and simulate basic interactions with people. For that they can use computer simulation software or physical computing technics.
This task will allow students to start thinking about new capacities they can add to the object and what technology they might need for that.

7. Weaknesses and opportunities: understanding how to add value with technologies

That theme explores different ways to add value utilising technology. General directions will be outlined with examples in lecture format. The directions are: make things more accessible, more robust, more efficient, more fun, more beautiful, more unique. There also will be field trips or interview sessions with Russian companies that merge things and technologies in their work. Thus, students will get an opportunity to see what problems these companies solve and what value they add.

> Course descrirption

8. Drafting design proposal

At that stage, students should already understand what their design problem could be and what they could do with their selected object to solve it. Here they will be asked to produce a design hypothesis and initiate the prototyping process.

9. Benchmarking similar projects

As soon as students decide on what they trying to build, they should do a benchmark of similar projects. How to do a benchmark will be explained in briefing lecture. Also, concepts of open source, DIY culture, creative hacking and plagiarism will be discussed. Students should critically review similar projects, identify their strong and weak points, attempt to approach and interview someone from creators' team and learn from their mistakes. This exercise should help students to kick start their prototyping, as well as avoid production of something, that already exists.

10. Prototyping

Prototyping process is divided into 2 stages. At the first stage, students should focus on rapid prototyping of at least 3 alternative approaches to solve their design problem. That is to identify the most appropriate one for further perfection during stage 2. Students should produce full-scale working prototype of a thing that's connected to the Internet and speculate on the larger impact that object would have if mass produced. By the end of prototyping stage, students should prepare an exhibition when they will get a chance to test their objects with real users. (Shukhov Lab could produce a simple website where feedback from all things produced by students will be displayed).

11. Telling a story

Final task for the course would be to produce a final report. General publishing technics and rules will be provided in a lecture format. The report should contain all exercises done during the course and convey the entire story of project development, not only final results. Importance of documentation using text, images, photographs, video and audio will be stressed at the very beginning of the course. The format of the report could vary: it might be a printed brochure, a video or a long-read blog post.

Required reading:

1. Shepard, M. (2011) Towards The Sentient City. In: Shepard, M., (eds.) Sentien City: Ubiquitous computing, architecture, and the future of urban space. New Yorke: The Architectural League of New Yorke and MIT Press, pp.16-37.

2. Ratti, C., Claudel, M. (2016) The City of Tomorrow: Sensors, Networks, Hackers, and the Future of Urban Life. Yale University Press.

3. McCullough, M. (2004) Digital Ground: Architecture, Pervasive Computing and Environmental Knowing. Cambridge, Mass.: MIT.

4. Mitchell, W. (2010). Me++. Cambridge, Mass: MIT.

5. Deyan Sudjic (2009). The Language of Things: Understanding the World of Desirable Objects. W. W. Norton

6. Carr, N. (2013). The big switch. New York: W.W. Norton & Co.

7. Rowland, C., Goodman, E., Charlier, M., Light, A. and Lui, A. (2015). Designing connected products. Beijing: O'Reilly.

8. Sundararajan, A. (2017). The sharing economy. Cambridge, Mass: The MIT Press.

9. Bogost, I. (2012) Alien Phenomenology, or What It's Like to Be a Thing. Minneapolis: University of Minnesota Press.

10. Reas C. and Fry B. (2004) Processing: A Programming Handbook for Visual Designers. The MIT Press

Lectures and talks:

1. The 10 great innovations that will change our cities – Carlo Ratti
2. The Internet of Things – James Whittaker
3. Innovate and succeed – Matt Webb
4. The birth of a word - Deb Roy
5. Designing for the internet of things - Rodolphe el-Khoury
6. Annual reports – Nicholas Feltron
7. Connected Cities - Carlo Ratti
8. Beyond Gadgets: Interactive Everything – Ivan Poupyrev
9. On neuroplasticity – Lara Boyd
10. The Clouds - a disruptive technology? – Radu Prodan

> Bibliography

GRADING SYSTEM

- attendance of the lectures, seminars and excursions (10%)
- critical review 1: analysis (20%)
- critical review 2: design concept (10%)
- critical review 3: final prototype (50%)
- final report (10%)

GUIDELINES FOR KNOWLEDGE ASSESSMENT

For each critical review students prepare presentation materials and arrange a small exhibition using auditorium walls and tables. Presentation materials could be drawings, images, physical models, animation, digital simulations and other. Typically, there will be a small jury formed from course tutors and invited experts to assess the work and provide feedback.

TEACHING METHODS

- debriefing
- class seminars
- peer reviews
- guest lectures and field trips
- discussion of video materials
- benchmarking
- reverse engineering and prototyping

RESOURCING AND SOFTWARE SUPPORT

- A 3D modelling software to prepare files for 3D printing (SketchUp)
- Publishing software to prepare reports and presentations (Indesign)
- Vector drawing software to prepare drawings and files for laser cutter (Illustrator, AutoCAD)
- Raster editing software to edit photographs and raster images (Photoshop)
- A video editor to prepare video reports (Premier Pro)
- Microcontroller and various electronic components to build prototypes (Arduino or similar)

READINGS ON URBANITY

Nadia Khort, MA

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Moscow, 2017

READINGS ON URBANITY

During the course students will read texts from a wide proposition offered to them. Each student will make a written critical analysis of the text and will evaluate the author's contribution to the urban thought and their influence on the current urban debate. Throughout the course each student will deliver a public presentation of the text and its critical evaluation, which will be followed by a debate in the group. This will promote a multi-faceted approach to urban issues and help develop a critical and open view on urban reality.

LEARNING OBJECTIVES

- to learn the fundamentals of the contemporary urban thought, from the key texts of the past decades
- to provide students with a critical knowledge of contemporary reality that is multi-thematic, multi-cultural and multi-temporal, in order to promote a vision of the wider reality, using texts by the authors who defined new ideas and shared them successfully with the public of their time
- to promote interest in reading professional literature
- to encourage critical reflection in writing that can be transformed into a habit
- to encourag debate among students on a variety of subjects, to teach students to express a consistent and well-reasoned position

LEARNING OUTCOMES

This founding course will enable students to learn through reading, writing and discussing the key issues of urban studies in order to develop a good critical view on the urban development and to implement this vision into the students' urban and technological projects. The suggested readings will address multiple areas, such as city economy, sociology, history, technology, philosophy, art, urban planning, design, activism, politics, etc. The texts will generally be contemporary, incorporating authors from the mid 20th century to the present.

COURSE PLAN

№	Theme	Total hours	Lectures	Seminars	Individual work
	Urban Theory under Conditions of Modernity				
	Origins of 'urbanity'				
1.	What is urban theory? Origins of 'urbanity': Max Weber, Georg Simmel, Walter Benjamin		4		4
	Empirical urban theory				
2.	Empirical urban theory in the UK and the USA in the beginning of the XX century			4	4
3.	Chicago School of Sociology			4	4
	Form and function of human settlement				
4.	Pro-modernist planning movements: F. Olmsted, Le Corbusier, F.L.Wrigh			4	4
5.	Ildefonse Cerda / Patrick Geddes			4	4
	In search for urban communities after World War II				
6.	Ghetto, gentrification: Ruth Glass, Suburbs: Kenett Jackson, Jane Jacobs			4	4
	Politics, people and power in the city : Neo-marxism and urban theory				
	Henri Lefebvre				
7.	Ira Katznelson: 'Marxism and the city' David Harvey: Social Justice and the city / rebel cities, Harvey Molotch, The Los Angeles School of Urbanism (E. Soja)			4	4
8.	Manuel Castells: 'City, class and power' / 'informationalism' / 'space of flows'			4	4
	Urban Theory under Conditions of Post Modernity				
	Global City				
9.	Saskia Sassen: 'Cities in a world economy' Amin and Thrift			4	4
	Postcolonial discourse: Cities of Global South				
10.	Postcolonialism and cities of Asia, Africa and Latin America			4	4
	City and representation				
11.	Urban Cultures, Sex in the city, The city as text, creative city			4	4
	Cities under stress				
12.	Climate change and environmental risks. Terrorism and armed conflicts. Vulnerable infrastructures			4	4
	The information city				
13.	The networked metropolis, Big Data and the rise of the smart cities			4	4
14.	Colloquium			4	6
15	Writing class			12	10
16	Essay presentation and discussion			4	10
			4	**76**	**82**

COURSE CONTENT AND READING LIST

1. What is urban theory? Origins of 'urbanity': Max Weber, Lewis Mumford, Georg Simmel, Walter Benjamin

Overall introduction to the course structure, work formats and grading system.
Max Weber: sociological term 'the city'. Types of the cities. The city of producers, the city of consumers, market city, agricultural city. The city in economic, legislative and administrative aspects. The historic development of the cities. Western city. The disappearance of estates in the western city, the development of bourgeoisie.
Georg Simmel: Big cities and modernity. Problems of big cities. Psychological environment of the big city. The big city and development of reflection. The city and money. The citizen as the human type: impersonality and individuality. Stranger. The specificity of the social relations in the big city. The city and the individual freedom.
Walter Benjamin: city as the representation of the historic epoch. Socially critical approach to the urban analysis. City and capitalism. Flaneur as the the of urban common man.

Required reading:

1. Sennett, Richard. Classic essays on the culture of cities. New York, Appleton-Century-Crofts, 1969.
To read: Max Weber 'The nature of the city' (24 pages)

2. Simmel, Georg. Metropolis and mental life. Chicago, Syllabus Division, University of Chicago Press, 1961.
To read 9 pages

3. Mumford, Lewis, and Donald L. Miller. The Lewis Mumford reader. New York, Pantheon Books, 1986.
To read 'What is the city?' (4 pages)

4. Benjamin, Walter, et al. One-Way street and other writings. London, Penguin, 2009.
For required readings to choose:
Naples p. 167 - 177 (10 pages)
or Moscow p. 178 - 208 (30 pages)
or Marseille p. 209 - 215 (14 pages)

5. Mike Savage. Walter Benjamin's Urban Thought: A Critical Analysis 1995

Additional reading:

1. The SAGE Handbook of Visual Research Methods, Eric Margolis, Luc Pauwels, London, SAGE Publications Ltd, 2011

2. A History of Spaces: Cartographic Reason, Mapping and the Geo-Coded World (Frontiers of Human Geography) John Pickles

3. Mennel, B. (2008) Cities and Cinema. London: Routledge

2. Empirical urban theory in the UK and the USA in the beginning of the XX century: Henry Mayhew, Charles Booth, Jane Addams, Jacob Pills

Spatial structure of London. Classification of citizens according to their welfare. Classification of citizens according to their occupation. Study of religious life and church activities in the city. Quantitative information and interviews materials. 'Moral' statistics. The importance of Charles Booth research. The 'social survey' movement in UK and USA.

Required reading:

1. Mayhew, Henry. London labour and the London poor. New York, Dover Publications, 1969.
To read 10 pages:
Section OF THE LONDON STREET-FOLK
Section THE LONDON STREET MARKETS ON A SATURDAY NIGHT
Section OF THE CHILDREN IN LOW LODGING-HOUSES

2. Booth, Charles, et al. Charles Booths London: a portrait of the poor at the turn of the century, drawn from his Life and labour of the people in London. Harmondsworth, Penguin, 1971.
To read p. 159 - 164

3. Addams, Jane. The spirit of youth and the city streets. United States, ReadaClassic.com, 2015.
To read 'Youth in the city' (9 pages)

Additional reading:

1. Charles Booth: Housing and poverty in Victorian London Paul Spicker published as Victorian values. Roof, 1989 14, 38-40;

3. Chicago School of Sociology

'Socio - ecological' approach of R. Park and its main characteristics. City as a 'social laboratory'. City as a mosaic of different worlds.
The classical work of L.Wirth 'Ghetto'. Jewish ghetto as a prototype of urban ghettos.

Required reading:

1. Wirth, Louis. The ghetto. New Brunswick, NJ, Transaction, 1998.
To read (14 pages)

2. PARK, Robert Ezra., et al. The City, etc. (Robert E. Park, Ernest W. Burgess, Roderick D. McKenzie.). Chicago, University of Chicago Press, 1967.
To read Chapter 1 'The City: Suggestions for the Investigation of the Human Behavior in the Urban Environment' (47 pages)

Additional reading:

1. An Introduction to the Chicago School of Sociology 1996

4. Pro-modernist planning movements: Frederick Olmsted, Le Corbusier, Frank Lloyd Wright

Functionalism in urban planning. Functionalism as a new philosophy of urban planning. Origins and consequences of functionalism. Broadacre City as the antithesis of a city and the apotheosis of the newly born suburbia, shaped through Wright's particular vision. Olmsted's principles of design

Required reading:

1. Olmsted, Frederick Law, and S.B Sutton. Civilizing American cities writings on city landscapes. New York, NY, Da Capo, 1997.
2. Corbusier, Le, and Frederick Etchells. Towards a new architecture. Connecticut, Martino Publishing, 2014. For required readings to choose on of two chapters chapters 'The lesson of Rome' p.149 - 175 (26 pages) or 'The Illusion of Plan' p. 175 - 199 (24 pages)
3. Wright, Frank Lloyd. Broadacre City. Tucson, AZ, Univ. of Arizona Press, 1995. To read (4 pages)

Additional reading:

1. Theodore S. Eisenman 'Frederick Law Olmsted, Green Infrastructure, and the Evolving City' 2013

5. Urbanism as exact science: Ildefonse Cerda and Patrick Geddes

Required reading:

1. Teorна General de la Urbanizaciyn ("General Theory of Urbanization", 1867), to support his 1859 project for the Barcelona Extension.
2. Geddes, Patrick. Cities in evolution. London, Benn, 1968.To read Chapter

6. In search for urban communities after World War II. Ghetto, gentrification, urban communities

Critics to functionalist urban planning. New urban communities. Fight for the urban communities

Required reading:

1. Jacobs, Jane, and Jason Epstein. The death and life of great American cities. New York, Modern Library, 2011. To read for everyone 'Introduction' (26 pages) + to choose one of the chapters

2. Ruth Glass 'London: aspect of change'

3. Jackson, Kenneth T. Crabgrass Frontier: the Suburbanization of the United States. Oxford Univ Pr, 2008. To read pages 20 - 45

Additional reading:

1. Gentrification of the City Tom Slater

7. Politics, people and power in the city : Henri Lefebvre

The social production of space.
Representation of space and its production.
The city in the conditions of neo capitalism.
Right to the city. New Urbanism.
Urban revolution.

Required reading:

1. Lefebvre, Henri, et al. Writings on cities. Oxford, Blackwell Publishing, 2008. To read: The Right to the City p. 63 - 177 (115 pages)

8. Politics, people and power in the city : David Harvey, Harvey Molotch and Edward Soja

Los Angeles School of urban studies.
Urban environment as a logic of spatial organization. Postmetropolis. Third spaces.
Cosmopolis. Sim city

Required reading:

1. Harvey, David. Rebel cities: from the right to the city to the urban revolution. London, Verso, 2013 To read (18 pages)

2. Molotch, Harvey Luskin. The city as a growth machine: toward a political economy of place: a summary of a paper and presentation. Portland, Or., Institute for Policy Studies, Portland State University, 1980. (25 pages)

3. E. Soja Why Spatial? Why justice? Why now? (16 pages)

Additional reading:

1. The New Regionalism: A Conversation with Edward Soja

2. The city and spatial justice

9. Politics, people and power in the city: Manuel Castells

City, information era and globalization. Concentration of knowledge and information in megapolises. Competition between cities. Global city as a process. Informational city. The role of megapolises.

Required reading:

1. Castells, Manuel. The urban question: a Marxist approach. Cambridge, Mass., MIT Press, 1980.

Additional reading:

1. Castells, Manuel, and Elizabeth Lebas. City, class and power. Houndmills, Macmillan, 1985.
2. Castells, Manuel. The informational city: information technology, economic restructuring, and the urban-Regional process. Oxford, Blackwell, 2002.
3. Castells, Manuel. The city and the grassroots: a cross-Cultural theory of urban social movements. Berkeley, Univ. of California P., 1983.

10. Global City: Saskia Sassen, Ash Amin, Nigel Thrift

Development of the concept of 'new urbanism'. Everyday practices in the city. The city and the global economics. City as a local and as a global phenomenon. Transnational urban systems.

Required reading:

1. 1. Sassen, Saskia. The global city: New York, London, Tokyo. Princeton, NJ, Princeton University Press, 2001. To read (13 pages)
2. Amin, Ash, and Nigel Thrift. Cities: reimagining the urban. Cambridge, Polity, 2013.

Additional reading:

1. Sassen, Saskia. Cities in a world economy. Los Angeles, SAGE, 2012.
2. Sassen, Saskia. Global networks, linked cities. New York, NY, Routledge, 2004.
3. Sassen, Saskia. Cities: between global actors and local conditions. College Park, MD., Urban Studies and Planning Program, University of Maryland, 1999.
4. Amin, Ash, et al. Cities for the many not the few. London, Policy Press, 2003.

11. Postcolonial discourse: Cities of Global South

Imperialism and orientalism in urban planning. The 'ordinary', 'mega', 'global' and 'peripheral'. neglected realities of cities beyond the west and embraces the global south as the epicentre of urbanism.

Required reading:

1. Seabrook, Jeremy. In the cities of the South: scenes from a developing world. London, Verso, 1997.
2. Myers, Garth Andrew. African Cities
3. Ananya Roy, Aihwa Ong Worlding Cities: Asian Experiments and the Art of being Global
4. Hernandez. Kelett 'Rethinking the Informal City: Critical Perspectives from Latin America',

Additional reading:

1. Said, Edward W. Orientalism. New York, Vintage Books, 2004.
2. Bhabha, Homi Jehangir. Location of Culture. Routledge, 1993.
3. Gayatri Spivak Can the subaltern speak?
4. Myers, Garth Andrew. Verandahs of power: colonialism and space in urban Africa. Syracuse (N.Y.), Syracuse University Press, 2003.
5. Postcolonial Cities

12. City and representation: Michel de Certeau

Required reading:

1. Certeau, Michel de, and Steven Rendall. The practice of everyday life. Berkeley, CA, University of California Press, 2011. To read Part III Spatial practices, pages 102 - 119
2. Hayden, Dolores. What would a non-Sexist city be like. Los Angeles, CA, University of California, 1980.
3. Pile, Steve, and Nigel Thrift. City A-Z. London, Routledge, 2001.
4. Clarke, David B. The cinematic city. London, Routledge, 2005.

13. Cities under stress: climate change, terrorism, diseases, vulnerable infrastructures

Required reading:

1. Baker, Judy L. Climate change, disaster risk, and the urban poor: cities building resilience for a changing world. Washington, The World Bank, 2012.

2. Body-Gendrot, Sophie. Globalization, fear and insecurity: the challenges for cities north and south. Basingstoke, Palgrave Macmillan, 2012.

3. Ali, S. Harris., and Roger Keil. Networked disease: emerging infections in the global city. Malden, MA, Wiley-Blackwell, 2008.

4. Graham, Stephen. Disrupted cities: when infrastructure fails. New York, NY, Routledge, 2010.

Additional reading:

1. Wamsler, Christine. Cities, disaster risk and adaptation. London, Routledge, 2014.

2. Elden, Stuart. Terror and territory: the spatial extent of sovereignty. Minneapolis, University of Minnesota Press, 2009.

3. Hodson, Mike, and Simon Marvin. After sustainable cities. London, Routledge, 2014.

14. The information city: The networked metropolis, Big Data and the rise of the smart cities

Required reading:

1. Deakin, Mark. Creating smart-Er cities. London, Routledge, 2013.

2. Greenfield, Adam. Against the smart city a pamphlet. This is Part I of "The city is here to use". New York City, Do projects, 2013.

Additional reading:

1. Graham, Stephen. The Cybercities reader. London, Routledge, 2004.

2. Campbell, Tim. Beyond smart cities: How cities network, learn and innovate. Abingdon, Oxon, Earthscan, 2012.

> Bibliography

15. The information city: Digitally divided cities, Software sorted city, Virtual urban worlds

Required reading:

1. Townsend, Anthony M. Smart cities: big data, civic hackers, and the quest for a new utopia. New York, W. W. Norton & Company, 2014.

2. Graham, Stephen, and Simon Marvin. Splintering urbanism: networked infrastructures, technological mobilities and the urban condition. London, Routledge, 2001.

3. Guallart, Vicente. The Self-Sufficient City: Internet has changed our lives but it hasn't changed our cities, yet. 2014.

4. Aurigi, Alessandro, and Fiorella De Cindio. Augmented urban spaces: articulating the physical and electronic city.

16. Colloquium

17. Writing class

18. Essay presentation and discussion

GRADING SYSTEM

- attendance of lectures and seminars (20%)
- active engagement on seminar (30%)
- colloquium (20%)
- essay (30%) (15% - text, 15% - presentation)

GUIDELINES FOR KNOWLEDGE ASSESSMENT

1. The seminar engagement will be ranked by the ability to express and to share critical position of the student in class.
2. The essay will be ranked by the quality of the text and presentation, ability to express critical position, wide range of used literature. Not matching deadlines will decrease the final mark.

TEACHING METHODS

- class seminars
- design thinking
- peer reviews

RESOURCING AND SOFTWARE SUPPORT

Laptop

RECORDING SOCIOLOGY

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Moscow, 2017

RECORDING SOCIOLOGY

The course will be based on the interaction between a critical vision of the social reality of our environment and the capacity of the audio-visual media to show the urban reality and tell a story. The course will cover both theory (introduction to media theory, photography, visual culture, project thinking) and practice (different exercises to produce audio and visual projects that will be either exhibited or published).

For example, first project would be focused on the relationship between the housing and the citizens' mode of living. The second one will be analysis of a place in the city and the way people use that space. The exercises will end up with discussions, shared presentations between all students and exhibitions. The course will develop skills to use a variety of audiovisual techniques and related software.

LEARNING OBJECTIVES

This founding course will provide students with socio-oriented method of observing urban reality. It will enable students to recognize that the city is at the service of people that inhabit it and that the inhabitants are those who build the city. Through the various audiovisual techniques, which will be represented in the course, the students will be able to recognize the behavior of people in the city and the patterns of the relationships between people and the city. The course will provide students with intense analytical vision of human behavior and sociological phenomena that often go unnoticed but which define the character of the cities.

LEARNING OUTCOMES

- Ability to analyze, verify, assess the completeness of the information in their professional activity, to look up and synthesize missing information, if necessary
- Ability to use basic techniques, ways and means of obtaining, storing, processing of information
- Ability to use the necessary tools and methods (software and application) for processing of the analysis and systematization of information on the subject of research
- Ability to participate in the study of fundamental and applied problems in the field of urban planning, as well as critically evaluate the associated scientific and technical information, both theoretical and practical problems

COURSE PLAN

№	Theme	Total hours	Lectures	Seminars	Practical / Field trip	Individual work
1.	Introduction to Contemporary Visual Arts. Art and Science. Contemporary Photography and Video and Social Science. Construction of the Gaze	32	10	4	2 (visit to Moscow Museum of Contemporary Art) + 2 (visit to Moscow Multimedia Art Museum)	14
2.	Brief history of Visual Sociology. Approaches to visual anthropology	14	2	4	2	6
3.	Technical, Methodological and Safety introduction	10	2	2	2	4
4.	Recording city: human interactions in the city environment	12	2	2	2	6
5.	Recording city: structures and movement in the city	12	2	2	2	6
6.	Understanding the city VS suburbs	14	2	2	4 (fieldtrip outside Moscow to suburbs/ countryside)	6
7.	Recording city: diversity and identity in the city	12	2	2	2	6
8.	Recording the city: "non places"/ places of exclusions	12	2	2	2	6
9.	Recording the city: borders and limits in the city	12	2	2	2	6
10.	Individual project	28		8	4	16
		158	**26**	**30**	**26**	**76**

COURSE CONTENT AND READING LIST

The course is divided into three parts. First is theoretical introduction (mostly lectures), second part is dedicated to six practical tasks and third part is students work on individual project.

Educational formats:

Lectures, followed by seminars where students make presentations about chosen artists.

1. Introduction to Contemporary Visual Arts. Art and Science. Contemporary Photography and Video and Social Science. Construction of the Gaze

First set of themes is strictly theoretical and is dedicated to general introduction to contemporary art. It will cover different topics, with main focus on methodology of art and science projects, especially art and social science. Apart from history of visual sociology and visual anthropology this set of lectures will cover modern methodological approaches to visual researches and researchers of the visual in the city and briefly explain the theory of visual and its political engagement.

Required reading:

1. Benjamin, W. (1999) The work of art in the age of mechanical reproduction. In,

Benjamin, W.Illuminations. London: Pimlico Press.

2. Observant states : geopolitics and visual culture McDonald, W. F. (W. Fraser) ;

Hughes, Rachel ; Dodds, Klaus

3. Visual Methodologies : An Introduction to Researching with Visual Materials,

G.Rose, London, SAGE Publications Ltd, 2011

4. The story of art. Gombrich, E. H. (Ernst Hans), 1909-2001

5. Debord, Guy-Ernest. Society of the Spectacle. Detroit, MI: Black and Red, 1983,

6. Certeau, Michel de. The Practice of Everyday Life. Translated by Steven Rendall.

Berkeley, CA: University of California Press, 1988

Additional reading:

1. The SAGE Handbook of Visual Research Methods, Eric Margolis, Luc Pauwels,

London, SAGE Publications Ltd, 2011

2. A History of Spaces: Cartographic Reason, Mapping and the Geo-Coded World

(Frontiers of Human Geography) John Pickles

3. Mennel, B. (2008) Cities and Cinema. London: Routledge

4. Foucault, Michel. Discipline and Punish: The Birth of the Prison. Translated by Alan

Sheridan. New York, NY: Vintage Books, 1995.

5. Understanding Media: The Extensions of Man. Marshall McLuhan.

6. Farish, M. (2005) Cities in shade: urban geography and the uses of noir. Environment

and Planning D: Society and Space, 23(1): 95-118.

2. Brief history of Visual Sociology. Approaches to visual anthropology

That topic will reveal different levels of interaction between city environment and art and make clear differences in urban and architecture photography.

Required reading:

1. Hagaman D. (1996) How I Learned Not To Be a Photojournalist. The University Press of Kentucky

2. Harper D (2012). Visual Sociology. London: Routledge.[7]

3. H.S.Becker (1974) Photography and Sociology in Studies in the Anthropology of Visual Communication.

4. Maria Lopez Yuste. Telling about the other. Identity, narratives and the limits of the photographic medium Vol 2, No 2 (2013)

5. Danny Lyon (1967) The Destruction of lower Manhattan. 1967

Additional reading:

1. Collier, John, Jr. 1967 Visual Anthropology: Photography as a Research Method New York: Holt, Rinehart and Winston.

2. Davidson, Bruce, et al. 1966 Contemporary Photographers: Toward a Social Landscape. New York: Horizon Press

3. Fraush P. (2003) The Image Factory: Consumer Culture, Photography and the Visual Content Industry Bloomsbury Academic, 2003

Other resources:

1. https://visualsociology.org/
2. https://www.youtube.com/watch?v=FY5uCxh35vs

Periodicals:

1. Visual Ethnography

3. Technical, Methodological and Safety introduction

It will cover necessary information on shooting in Moscow. It will provide brief outlook of current safety regulations of photo and video shootings in Russia and give very basic information on technical issues – both of production and post-production.

Required reading:

1. Maxim Sher
2. Alexander Gronskyy
3. Ludmila Zinchenko
4. Wladislav Efimov
5. Project Moscovia. Research

(Mokrov, Karelina, Minkova, Kamenskaya, Chernishova, Antonov, Shokhov, Tsibizova)

6. Silver Camera – annual photo completion dedicated to Moscow
7. Igor Mukhin
8. Bill Owens. Suburbia, 1973
9. Danny Lyon. The destruction of Lower Manhattan, 1967
10. Peter Fischli & David Weiss: 800 Views of Airports, 1970
11. 'Metropolis', movie, 1927 by F. Lang

4. Recording City: Human Interactions in the City Environment

This theme is dedicated to human interactions in the city. That is one and only topic dedicated to people in the city. So students will explore different ways of communications in the city (both verbal and non verbal) and its particularities in the post-Soviet case. Those will include trade relationship, services, communication in public places, communication (or its absence) in transport and so on. Students will learn how to reveal those and present them in a art form in their projects.

5. Recording City: 'Structures' and 'Movements' in the City

This topic will engage with different forms of movements in the city versus stable structures. This task is one of the basic ones to learn how to record and present movements in the city on contrary to stable constructions and buildings. Students are free to choose which movements they are willing to explore – that might be transport system, pedestrian ways, paths etc. By 'structures' here I mean huge functional elements of the city such as residential areas, blocks, squares and neighbourhoods. The correspondence of those two will provide a sense of a living city, which students will capture and present.

6. Understanding the City vs. Suburbs

That topic will involve critical study of Moscow suburbs and nearby landscapes vs Moscow itself. That case will allow students, who didn't have a chance to see the differences of build environment, human interactions and landscapes itself in Moscow and nearby areas to do that. That will raise project of visual comparison of urban landscapes vs suburban ones.

7. Recording City: Diversity and Identity in the City

This task is aiming to learn how to see diversity in the city, not neglecting at the same time identities. Students are free to choose whatever "diversity" can refer to – ethnicity and nationalities, means of transport, colours, buildings etc. The main goal of the task is to find a way of showing differences in a row of topologically close objects, preserving their identities and giving a viewer a chance for comparison.

8. Recording city: 'Non' Places / Places of Exclusions

'Non' places – places without specific labels, with no specific function, places of 'passing through' and waiting. They even have formed specific direction in art. The main goal of this task is to learn how to see and define them in the city environment, how and what to shoot within them and how present them to a viewer. Students will learn how to transfer the feeling of abandonees, emptiness and uselessness.

> Course descrirption

9. Recording city: Borders and Limits in the City

The task is dedicated to artificial (and not only) borders and limits in the city. Those can be limits of access, roads, borders of districts or parking zones – anything that pulls city apart in mental or physical way. By completing this task students will learn how to shoot and present linear structures, differences or similarities, breaks and discontinues.

10. Individual Project

Students are free to choose specific topic or/and specific district in Moscow, find a relevant problem or a point of discussion (which can be either personal or more social/economical) and work on their final project, that will be presented as part of a group show. Hopefully, one of the practical tasks will lead to a one final project. Topics for individual projects though must not repeat the ones that were listed for practical classes. Students will have several seminars where they are welcome to share their work in progress, discuss difficulties, get critical feedback from other students. Apart from that there will be some of the Russian artist invited (Maxim Sher, W. Efimov, S. Pchelkin – TBC) to present their experience and to give feedback as well. Final projects will be presented as a part of a group show in Shukhov lab by the end of the semester.

GRADING SYSTEM

- attendance of lectures and seminars (10%)
- presentation on seminar (30%)
- work during practical tasks (30%)
- final individual project (40%)

Final individual projects will be presented as part of student's group exhibition in Shukhov lab space (TBC) and will be available for wide audience after defence of the projects (final exam). Afterwards, there will be a round table organised with art professionals (artists, critics, journalists) to discuss final projects and receive valuable feedback. However, final marks for individual project will not be based on professional and/or public opinion.

GUIDELINES FOR KNOWLEDGE ASSESSMENT

The presentation on seminar will be ranked by originality of topic and critical author's position.
The practical tasks will be ranked by originality of theme, quality of the project, author's following of basic rules of photo and video production, self-criticism. Not matching deadlines will decrease the final mark.

> Course descrirption

QUESTIONS THAT MIGHT BE ASKED DURING DEFENCE OF THE INDIVIDUAL PROJECT

1. What is the art traditions (or artist) you are following in your project?
2. What are theoretical frameworks of your project?
3. Where and when the project was shot? Why?
4. Which theme/topic it reveals? Why do you think it is important in contemporary Russia?
5. What methodology you were using?
6. What city problem/ dimension your project speaks to?
7. Describe critically gaze you have constructed.

TEACHING METHODS

The first part of the course will be based on set of theoretical interactive lectures. A lot of visual materials will be included in those lectures.
Seminars will be dedicated to different cases of art projects connected to city environment, presented by students. Those seminars will be held as free discussion of each art project presented, critically approached by the audience.

Apart from that the will be practical classes and fieldworks, during those students will be trained how to work on streets, how to shoot projects etc.
Apart from listed above some of the seminars will be held as workshop/meeting with invited artists. Among others there will be Russian photographers Maxim Sher, Alexander Gronskyi, Sergei Novikov, Wladislaw Efimov etc.

RESOURCING AND SOFTWARE SUPPORT

Depending on their projects students might use software to work on their projects (such as Adobe Photoshop or Premiere or their free equivalents).

NEW BUSINESS MODEL

Ptitsyn Andrei, PhD

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Moscow, 2017

NEW BUSINESS MODEL

This course aims to provide an overview of the interaction between functioning of the city and business approaches which support every urban project: from the construction of buildings and operation of utility networks to the different services that are offered in the city. During the course students will study the relationship between investments in the urban systems and their operations.

Students will also explore the economic nature of the common good and its impact on city management. This course will provide students with the instruments to analyze development projects, urban public projects and public private partnerships with a particular focus on studying modern business models that support the principles of a distributed city.

LEARNING OBJECTIVES

The course covers the analysis of different models of creating and managing the urban systems, such as private, public, public private partnership and social management. It also includes the study of business models for managing buildings, urban infrastructure and urban services. The course focuses on the development of the analytical skills, writing logical texts and delivering public presentations. Finally, the students are expected to get involved in the research and propose new business models for existing or new city services based on the "distributed city" principles.

LEARNING OUTCOMES

Upon completion of the course, students will be able to:

- understand the relationship between the functioning of the city and business approaches which support every urban project
- define such terms as business model, strategy and related notions
- understand different approaches for managing buildings, urban infrastructure and urban services
- formulate the crucial features of a business model
- identify the factors, affecting the growth and development of urban communities and their interaction with the environment
- develop a holistic approach to urban environment on the basis of interdisciplinary research
- critically analyze, search and generalize the scientific data in the area of business models using special tools
- understand the laws regulating the urban environment and current trends
- explain the growth and development factors of urban communities
- learn how to solve independently theoretical and practical issues in contemporary cities
- start learning how to carry out in-depth analysis and interpret qualitative and quantitative data regarding urban environment
- participate in debates and roundtables in this field.

COURSE PLAN

№	Theme	Total hours	Lectures	Seminars	Practical / Field trip	Indi-vidual work
1.	Introduction to business models in urban environment	4	2	2		
2.	Models of urban governance	2	2			
3.	Public private partnerships. NGOs in city planning	2	2			
4.	Value creation model for the future cities. Value based management	4		4		
5.	'Distributed city' principles, resilient cities	4	2	2		
6.	Business models for a compact city. Urban sprawl	4	2	2		
7.	Smart cities as a new stage in urban development	4	2	2		
8.	Sustainable development and ecosystem services in urban planning. Brownfields	4	2	2		
9.	Pros and cons of the eco-design and its economic impact	4		4		
10.	Nature of the common good and its impact on the city management	4	2	2		
11.	Investments and urban systems	4	2	2		
12.	Techniques for the analytical modeling	4	2	2		
13.	Developing models for innovative businesses. Start-up models	4	2		2	
14.	Business models design and canvas development	4	2	2		
15.	Aligning strategy and business models. Strategic plans	4	2	2		
16.	Business performance and balanced scorecard. Effectiveness and efficiency	2	2			
17.	Lean startup methodology	4	2	2		
18.	Time value of money and cashflow management	4	2	2		
19.	Managing growth. Business development	2		2		
20	Porter's five forces analysis	2	2			
21.	Implementing new business models	4	2	2		
22	Presenting business models	2		2		
		94	**42**	**38**	**2**	

COURSE CONTENT AND READING LIST

1. Introduction to business models in urban environment

In this topic, we start with the key definitions, such as business models, prototype, future city and explore, how business models operate in urban environment. The relation of business models to other notions in management (business planning, management, quality, control, government, governance) is reviewed. Different types of business models are analyzed such B2B, B2C, B2G. Using the examples of Uber and Gett we review, how business models shape contemporary cities.

Required reading:

1. Harvard Business Review. (2017). What Is a Business Model?.
2. Shafer, Scott M., H. Jeff Smith, and Jane C. Linder. "The power of business models." Business horizons 48.3 (2005): 199-207.

Additional reading:

1. Johnson, Mark W., Clayton M. Christensen, and Henning Kagermann. "Reinventing your business model." Harvard business review 86.12 (2008): 57-68.

2. Models of urban governance

This section analyzes different models of urban governance. First, we define the concept of urban governance and urban systems. Second, we explore 4 main urban models: managerial, corporatist, progrowth and welfare. Further, we explore which model is better for a particular city such as Moscow, New York or London. Third, we examine the models for renaturing brownfield areas such as classical or cultural landscape restoration model

Required reading:

1. Pierre, Jon. "Models of urban governance: the institutional dimension of urban politics." Urban affairs review 34.3 (1999): 372-396.
2. Westphal, Lynne M., P. H. Gobster, and Matthias Gross. "Models for renaturing brownfield areas." Restoration and history: the search for a usable environmental past. Routledge, New York (2010).

3. Public private partnerships. NGOs in city planning

This class explores how public private partnerships operate and what is the role of NGOs in city planning. We review the cases of public private partnership in Russia, Burkina Faso and other countries. We discuss the role of NGOs in city planning and how NGOs in the U.S. and Russian Federation operate using the example of Pittsburgh, USA and Moscow, Russia.

Required reading:

1. Faso, In Burkina. "Public Private Partnership." (2016)
2. Viravaidya, Mechai, and Jonathan Hayssen. Strategies to strengthen NGO capacity in resource mobilization through business activities. PDA and UNAIDS joint publication, 2001
3. Pittsburg Park Conservancy

Additional reading:

1. Pankaja Kulabkar, NGOs and Urban Planning in India: The Case of Pune's Development Plan,
2. Case study. The path towards sustainable urban regeneration in Vilnius
3. Weihe, Gudrid. Public-private partnerships: Meaning and practice. Diss. Department of Business and Politics. Copenhagen Business School, 2008.
4. Stelling, Christiane. Public-private Partnerships & the Need, Development and Management of Trusting: A Processual and Embedded Exploration. Copenhagen Business School [Phd], 2014.

4. Value creation model for the future cities

This block discusses what is the value and how measure it. We study, how to create value in government and business and what is the difference. We review the connection of public value with operations capacity, legitimacy and support. We discuss then, how to build the company, which offers services or goods with high added value.

Required reading:

1. Lovata, Linda M., and Michael L. Costigan. "Empirical analysis of adopters of economic value added." Management Accounting Research 13.2 (2002): 215-228.
2. Weber, Rachel. "Extracting value from the city: neoliberalism and urban redevelopment." Antipode 34.3 (2002): 519-540

Additional reading:

1. Tsai, Wenpin, and Sumantra Ghoshal. "Social capital and value creation: The role of intrafirm networks." Academy of management Journal 41.4 (1998): 464-476.

5. 'Distributed city' principles, resilient cities

We explore the concept of distributed city and see in the relation to other contemporary approaches to urban planning such as smart cities, compact cities, renewable energy city, carbon neutral cities and resilient cities. We also track, how cities were shaped in Russia and Soviet Union and how approaches to urban planning have evolved. We discuss consumerist society and if knowledge about the consumer society is important for business modelling.

Required reading:

1. Newman P. The distributed city
2. Bunning, Jessica. "Governance models supportive of distributed green infrastructure for decarbonised resilient cities." State of Australian Cities Conference. 2011.

6. Business models for a compact city. Urban sprawl

We define the concept of a compact city and urban sprawl. A compact city allows higher energy saving and provides other benefits such as more interaction between people. We study, how different countries deal with urban sprawl (Russia, United States). According to OECD "the current urban and transport policies are promoting an excessive growth in car trips to the city and its outskirts, being this the cause for the rise in traffic congestion, air pollution, noise, acid rain and the risk of global warming". Fortunately, many cities develop public reliable transportation. Energy consumption per person is four times higher in the automobile than the bus according to Frediani, which is typical for urban sprawl.

Required reading:

1. Frediani, Julieta Constanza, et al. "Compact City-Sprawl City: two interacting urban forms." 44th ISOCARP Congress (Dalian, China, 2008). 2008.

2. Holden, Erling, and Ingrid T. Norland. "Three challenges for the compact city as a sustainable urban form: household consumption of energy and transport in eight residential areas in the greater Oslo region." Urban studies 42.12 (2005): 2145-2166.

7. Smart cities as a new stage in urban development

We take the students through the concept of smart cities and its components: smart governance, smart energy, smart building, smart mobility, smart infrastructure, smart technology, smart healthcare and smart citizen. We compare smart cities and resilient cities. We also explore, how countries and cities present their smart cities worldwide (Olympic Games, FIFA, EXPO and so on).

Required reading:

1. Caragliu, Andrea, Chiara Del Bo, and Peter Nijkamp. "Smart cities in Europe." Journal of urban technology 18.2 (2011): 65-82.

2. Rob Dubbeldeman, Stephen Ward, Smart Cities, How rapid advances in technology are reshaping our economy and society, Version 1.0, November 2015

Additional reading:

1. Rick Robinson, The new architecture of Smart Cities

2. Nam, Taewoo, and Theresa A. Pardo. "Conceptualizing smart city with dimensions of technology, people, and institutions." Proceedings of the 12th annual international digital government research conference: digital government innovation in challenging times. ACM, 2011.

8. Sustainable development and ecosystem services in urban planning. Brownfields

We study the concept of sustainable development and its 3 dimensions such as economic, environmental and social and related notions such as strong and weak sustainability, carrying capacity, carbon footprint. We also learn about brownfields in Moscow and in other areas and review how these areas can be recovered. We carry out the game Ecolopoli.

Required reading:

1. Can a collapse of global civilization be avoided? Paul R. Ehrlich and Anne H. Ehrlich
2. Pampols David, Indicators of urban sustainability for model of change,

Additional reading:

1. Limits to growth. 30-Year update. Donella Meadows, Jorgen Randers, Dennis Meadows.
2. CHRISTOPHER A. DE SOUSA Urban brownfields redevelopment in Canada: the role of local government
3. Heberle, Lauren, and Kris Wernstedt. "Understanding brownfields regeneration in the US." Local Environment 11.5 (2006): 479-497.
4. Gymez-Baggethun, Erik, and David N. Barton. "Classifying and valuing ecosystem services for urban planning." Ecological Economics 86 (2013): 235-245.
5. Bastian, Olaf, Dagmar Haase, and Karsten Grunewald. "Ecosystem properties, potentials and services—The EPPS conceptual framework and an urban application example." Ecological indicators 21 (2012): 7-16.

9. Pros and cons of the eco-design and its economic impact

We discuss the concept of eco-design and examples in the city. We analyze related notions such as energy efficiency, solar panels, water fountains. We also see, what are the benefits of eco-design for the city (economic, social and educational).

Required reading:

1. Knight, Paul, and James O. Jenkins. "Adopting and applying eco-design techniques: a practitioners perspective." Journal of cleaner production 17.5 (2009): 549-558
2. Eco cities: ecological cities as economic cities

Additional reading:

1. Deepa Kylasam Iyer, Rashmi Nayar, The Case of the IT Park: Analysing the International Tech Park, Bangalore through the Eco Industrial Approach in Urban Planning

10. Nature of the common good and its impact on the city management

First, we differentiate common good from other types of goods such private, club and public goods. We explore the nature of the common good. Second, we discuss what is the nature of common good and how government can control the distribution of goods in the economy.

Required reading:

1. John Friedmann. The common good: assessing the performance of cities
2. Ilaria Boniburini, Luisa Moretto, Judith Le Maire, Harry Smith, The city as a common good

Additional reading:

1. James Lee Anderson, A Recent Controversy on the Common Good, Loyola University Chicago, 1957

11. Investments and urban systems

We debate what is the role of investments in cities and how the government can regulate it. Besides, we review different tools of measuring investment climate: doing business approach, global competitiveness index.

Required reading:

1. Alan Coulthart, Nguyen Quang, Henry Sharpe, Urban Development Strategy. Meeting the challenges of rapid urbanization, and the transition to a market oriented economy
2. Australian government. A national urban policy for a productive, sustainable and liveable future.

Additional reading:

1. Global competitiveness report
2. Doing business 2016, International Bank for Reconstruction and Development / The World Bank

12. Techniques for the analytical modeling

We review the techniques for the analytical modeling such as forecasting, optimization, simulation, decision analysis and classification. As a home assignment, students are asked to implement one of the methods in practice. System dynamics is studied as a powerful tool for analytical modelling.

Required reading:

1. Rong Du, Urban growth: Changes, management, and problems in large cities of Southeast China, Frontiers of Architectural Research, Volume 5, Issue 3, September 2016, Pages 290-300

2. Hans Hennekam, Frank Sanders, Making Complex Network Analysis in System Dynamics

Additional reading:

1. Application of an integrated system dynamics and cellular automata model for urban growth assessment: A case study of Shanghai, China, Ji Hana, Yoshitsugu Hayashi, Xin Cao, Hidefumi Imura
2. Waddell, Paul. "UrbanSim: Modeling urban development for land use, transportation, and environmental planning." Journal of the American planning association 68.3 (2002): 297-314.
3. UrbanSim: Modeling Urban Development for Land Use, Transportation and Environmental Planning, Paul Waddell, Daniel J. Evans

13. Developing models for innovative businesses. Start-up models

We study how to create the models for innovative businesses using classic and contemporary approaches such a lean startup. We review the cases of successful start-ups and the cases of start-ups, which failed.

Required reading:

1. Teece, David J. "Business models, business strategy and innovation." Long range planning 43.2 (2010): 172-194.
2. 9 Proven Business Models to Consider for Your Startup, Nino Tomaro

14. Business models design and canvas development

We study how to create the business model in practice. We review the key elements of business model such as infrastructure, offering, customers, finances and resources. The book of one of the guru's in business modelling, Osterwalder is studied.

Required reading:

1. Osterwalder A, Pigneur Y, Christopher L. Tucci. Clarifying business models: origins, present and future of concept (англ.). Communications of the Association for Information Systems (2005).

Additional reading:

1. Osterwalder, Alexander, and Yves Pigneur. Business model generation: a handbook for visionaries, game changers, and challengers. John Wiley & Sons, 2010.

2. The Innovative Business Model Canvas in the System of Effective Budgeting, Mikhail Nikolaevich Dudin, , Georgiy Nikolaevich Kutsuri, , Irina Jur'evna Fedorova, 2, Svetlana Sozrykoevna Dzusova, Anzhela Zafitovna Namitulina

15. Aligning strategy and business models. Strategic plans

We discuss the definition of strategy and how the strategy is related to business models. We study the examples of good and bad strategies. Also we discuss how to develop a strategy that can be implemented in the dynamic environment. We discuss, how in the world businesses and cities can deals with "black swans".

Required reading:

1. From Strategy to Business Models and to Tactics, Ramon Casadesus-Masanell, Joan Enric Ricart

Additional reading:

1. The Black Swan: The Impact of the Highly Improbable. Nassim Taleb.

16. Business performance and balanced scorecard. Effectiveness and efficiency

One of the best indicators of business performance is business valuation and its change, however it is quite difficult to measure it. Often the valuation of innovative companies is so complex, that investors analyze the team qualification and evaluate the business performance primarily using this criterion. In the last few years, several M&A were carried out on the basis of team qualification: the investor explores the team and makes the decision if it is able to reach the goals. Actually, team qualification is even more important the number of workers: smart creatives are crucial for business performance.

Required reading:

1. From Strategy to Business Models and to Tactics, Ramon Casadesus-Masanell, Joan Enric Ricart

2. Innes, Judith, and David E. Booher. "Indicators for sustainable communities: a strategy building on complexity theory and distributed intelligence." Planning theory & practice 1.2 (2000): 173-186.

Additional reading:

1. Ptitsyn A V. Measuring Innovative Performance. E-journal.spa.msu.ru

17. Lean startup methodology

We review the main principles of lean startup, such as entrepreneurs are everywhere, entrepreneurship is management, validated learning, build-measure-learn and innovation accounting and discuss if there are useful for business modelling.

Required reading:

1. Reis, Eric. "The lean startup." New York: Crown Business (2011).

2. Good Practices of the Lean Startup Methodology: Benefits, challenges and recommendations, Marc Salas Mart´ınez

18. Time value of money and cashflow management

Time value of money is one of the foundations of management and business model development. We review such definitions as present value, future value, discount rate. We define the main types of cashflow such as free cashflow and net cash flow. We review different ways of calculating cash flow (direct and indirect).

Required reading:

1. Introduction To The Time Value Of Money
2. Cash Flow Management And Credit Use: Effect Of A Financial Information Program

19. Managing growth. Business development

We discuss how companies can manage their growth, using the classic approach of Robert Higgins. We clarify, what is the difference between growth and development.

Required reading:

1. Higgins, Robert C. "How much growth can a firm afford?." Financial management (1977): 7-16.
2. Higgins, Robert C. "Sustainable growth under inflation." Financial Management (1981): 36-40.

20. Porter's five forces analysis

We study Porter's five forces analysis, including threat of new entrants, threat of substitutes, bargaining power of customers, bargaining power of suppliers and industry rivalry and discuss how this analysis can be used in business modelling.

Required reading:

1. Porter, Michael E. "The five competitive forces that shape strategy." Harvard business review 86.1 (2008): 25-40.
2. Grundy, Tony. "Rethinking and reinventing Michael Porter's five forces model." Strategic Change 15.5 (2006): 213-229.

21. Implementing new business models

Implementing a new business model might be tricky, because the external environment changes dynamically. We discuss how to apply a business model in unpredictable environment.

Required reading:

1. Osterwalder, Alexander, and Yves Pigneur. Business model generation: a handbook for visionaries, game changers, and challengers. John Wiley & Sons, 2010.

22. Presenting business models

During this session we learn, how to present business models and discuss the common pitfalls associated with presentations: loss of eye contact, reading, but not speaking, too much information on slides.

Required reading:

1. Kapterev A. Death by PowerPoint (and how to fight it)

Additional reading:

1. Collins, Jannette. "Education techniques for lifelong learning: giving a PowerPoint presentation: the art of communicating effectively." Radiographics 24.4 (2004): 1185-1192.

GRADING SYSTEM

The grading system is organized as follows:

- attendance and participation - 40%
- research - 60%, including
- written papers - 30%
- oral presentation - 30%

GUIDELINES FOR KNOWLEDGE ASSESSMENT

Here are some sample questions:

1. Please define a business model
2. What are the components of a business model?
3. What is the difference between effectiveness and efficiency?
4. How do investments influence urban systems?

TEACHING METHODS

Instructor's presentations and discussions with students. Business role games. Case studies and real life examples. Individual city projects by students, their shared assessment. Occasional quizzes might take place. The field trip can be planned to Skolkovo Innovation Center or to other sites.

RESOURCING AND SOFTWARE SUPPORT

Students need the access to Google Scholar (scholar.google.com)

TECHNOLOGIES: THINGS

Ivan Mitrofanov, specialist

Contact:
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Moscow, 2017

TECHNOLOGIES: THINGS

The course will run over 18 weeks in the laboratory setting. Every two weeks a particular aspect of technological fabrication, such as digital manufacturing, electronics or programming, will be explained and practiced. The course will include networking with other international fabrication laboratories, and some of the projects will be developed in collaboration with international groups and team leaders in a remote mode. As a result of the course, students will be able to integrate multiple technologies and information sources in their projects during the Master program.

Goals:
The course implies students' active involvement in creating new technologies using laboratory equipment. The goal of the course is to teach students how to make technological elements using digital manufacturing, electronics and programming. By acquiring relevant skills students will learn to produce a variety of mechanisms, sensors, microcomputers, information platforms and other elements that can be used at the city scale. The course consists of exercises that help familiarise with these technologies and encourage students to produce more complex objects throughout the Master program.

LEARNING OBJECTIVES

This course will introduce students to digital design and fabrication techniques within the context of urban planning and development. Through a series of technical demonstrations, students will make connections between computer-aided-design / computer-aided-manufacturing (CAD/CAM) software, digital fabrication technologies and the physical world. Students will complete a series of projects exploring 3D modeling, CAD applications, 3D scanning technologies, and experimental approaches to digital model generation. Simultaneously, digital models will be made physical through additive and subtractive fabrication technologies including 3D printing, CNC milling, and laser cutting.

COURSE CONTENT AND READING LIST

1. Introduction to digital fabrication; Safety at lab training; Rights and responsibilities

Introductory class where students will learn the concepts of digital fabrication, meet new equipment, tools and practices, have the system and principles of FabLab network explained, will learn safety and emergency protocols, and students rights, responsibilities, lab timing, supplies stores, and everything students might need during lab work.

2. Computer aided design

The class to learn raster, vector, 3d design, parametric design, game engines and simulations. Whether a student is new to CAD or already using parametric CAD software, this class includes everything one will need. Instructors will introduce some valuable tools for learning and teaching design essentials, and give you great tips and tricks from industry professionals. Through a scaffolded learning experience, students will develop their 3D modeling skills by applying them to a real world design.

3. Computer controlled cutting

This class will introduce such topics needed for laser and vinyl cutting as marking, engraving, folding, press-fit constructions, complete list of tools, materials, and services that will help you follow along with the class. Students will learn how to prep the material, how to set up the machine, and how to get the best results for the finished product.

4. 3d printing and scanning: principles, processes, machines and software, scales

In this class, students will learn everything they need to know to design and 3D print own creations. Practice the ins-and-outs of desktop 3D-printing, and learn how to sketch by hand so students can generate solid ideas. History and development of 3d printing in years. How to set up, run, and fix the printers. Setting up and using 3d scanners of all kinds.

> Course descrirption

5. CNC operations

In this class, students will learn everything they need to know to design and create their own CNC cut projects and get access to a CNC router. Instructors will cover cutting flat panels for flat-pack furniture, carving complex 3D forms, desktop CNC mill operation, CNC router operation, design principals and techniques, and how to get one's designs out of the computer and onto a CNC machine.

6. Electronics design, operations, programming

This class will cover all the concepts of modern electronics design, development, programming, embedding. Students will learn how to use existing programmable electronic pieces like Arduino and Edison, and how to create own electronic circuits, mill and solder it, and use in own projects for home and city automation, gathering sensors information, make interactive tools, operate developed robots, and many more.

GRADING SYSTEM

- attendance - mandatory
- participation and workshops (20%)
- assigned projects (80%)

GUIDELINES FOR KNOWLEDGE ASSESSMENT

Students must demonstrate satisfactory achievement of course objectives through fulfillment of course assignments and by contributing to class discussions and critiques. Course assignments will require students to use software and equipment available at the lab and actual objects that have been created by applying digital fabrication processes.
Overall grades are based on in-class participation and completed projects. Instructors will be looking for development of conceptual clarity, evidence of research, aesthetic application of software and technology, understanding of project concept and problem solving abilities. Expectations will be explained in detail for each project when it is assigned. If anything seems unclear, students are responsible for asking the instructor for clarification far in advance of the due date. In order to receive a grade, students must turn work in by the due date. Work that is not turned in on time will result in a reduced grade.

> Course descrirption

Required reading:

1. Frederick P. Brooks Jr. (1995) The Mythical Man-Month: Essays on Software Engineering. Addison-Wesley Professional; Anniversary edition

2. Neil Gershenfeld (2008) Fab: The Coming Revolution on Your Desktop - from Personal Computers to Personal Fabrication. Amazon Media EU S.a r.l.

3. Julia Walter-Herrmann, Corinne Bьching (2014) FabLab: Of Machines, Makers, and Inventors (Cultural and Media Studies). Transcript-Verlag

4. Blikstein, P. (2013) Digital Fabrication and 'Making' in Education: The Democratization of Invention. FabLab Book

5. Peter Troxler (2013) Making the 3rd Industrial Revolution: The Struggle for Polycentric Structures and a New PeerProduction Commons in the Fab Lab Community. Transcript Publishers

6. Paul Horowitz, Winfield Hill (2015) The Art of Electronics. Cambridge University Press

7. Daniel Shiffman (2015) Learning Processing, Second Edition: A Beginner's Guide to Programming Images, Animation, and Interaction (The Morgan Kaufmann Series in Computer Graphics). Morgan Kaufmann

8. Paul Scherz, Simon Monk (2016) Practical Electronics for Inventors, Fourth Edition. McGraw-Hill Education TAB

9. Elliot Williams (2014) AVR Programming: Learning to Write Software for Hardware. Maker Media, Inc

10. Neil Gershenfeld (2011) The Nature of Mathematical Modeling. Cambridge University Press; Reissue edition

11. Paul Scherz, Simon Monk (2016) Practical Electronics for Inventors. McGraw-Hill Education TAB; 4th edition

12. Takashi Kenjō (1991) Electric motors and their controls: an introduction. Oxford University Press

13. Irving M. Gottlieb (1994) Electric Motors & Control Techniques. TAB Books

14. Stuart Ball (2003) Analog Interfacing to Embedded Microprocessor Systems, Second Edition (Embedded Technology Series). Newnes; 2nd edition

15. Jacob Fraden (2016) Handbook of Modern Sensors: Physics, Designs, and Applications. Springer; 5th ed. 2016 edition

16. Marijn Haverbeke (2014) Eloquent JavaScript: A Modern Introduction to Programming. No Starch Press; 2nd edition

17. Zed A. Shaw (2013) Learn Python the Hard Way: A Very Simple Introduction to the Terrifyingly Beautiful World of Computers and Code. Addison-Wesley Professional; 3rd edition

18. Roberto Naboni , Ingrid Paoletti (2015) Advanced Customization in Architectural Design and Construction (SpringerBriefs in Applied Sciences and Technology). Springer

19. Dhananjay Gadre (2000) Programming and Customizing the AVR Microcontroller. McGraw-Hill Education

20. Mark Lutz (2013) Learning Python. O'Reilly Media

21. John H. Moore, Christopher C. Davis, Michael A. Coplan, Sandra C. Greer (2013) Building Scientific Apparatus. Cambridge University Press; 4th edition

22. Arturo Tedeschi (2014) AAD Algorithms-Aided Design. Parametric strategies using Grasshopper. Edizioni Le Penseur

> Bibliography

Additional reading:

1. Charles Platt (2015) Make: Electronics: Learning Through Discovery. Maker Media, Inc

2. Greg Peek, Dave Roberts (2014) SMT Soldering: It's Easier than You Think. SiliconFarmers

3. Carla Schroder (2004) Linux Cookbook. O'Reilly Media

4. Matthew Scarpino (2015) Motors for Makers: A Guide to Steppers, Servos, and Other Electrical Machines. Que Publishing

5. Neil Gershenfeld (2011) The Physics of Information Technology (Cambridge Series on Information and the Natural Sciences). Cambridge University Press; Reissue edition

6. Alexander H. Slocum (1992) Precision Machine Design. Society of Manufacturing; illustrated edition

7. Joyce Yee, Emma Jefferies and Lauren Tan (2013) Design Transitions: Inspiring Stories. Global Viewpoints. How Design is Changing. BIS Publishers

8. Fabien Eychenne (2012) Fab Labs overview. Fing Association

9. Joel Grus (2015) Data Science from Scratch: First Principles with Python. O'Reilly Media

> Bibliography

		City Project: Things	Readings on Urbanity	Recording Sociology	New Business Models	Technologies: Things		Talks on Urban Innovation	KIDS Fab Lab
		Mon 15:00-21:00	Tue 18:00-21:00	Wed 18:00-21:00	Thu 18:00-21:00	Fri 15:00-21:00		Sat	Sun
		Andrey Yelbaev / Vicente Guallart / Elena Mitofanova	Nadia Khort	Sofia Gavrolova	Andrey Ptitsin	Ivan Mitrofanov			
W-1	Sept 11-15	Introduction to City Project: Connected Things. Course structure, learning method, deliverables.	Origins of 'urbanity': What is urban theory? Origins of 'urbanity': Max Weber, Lewis Mumford, Georg Simmel, Walter Benjamin	Introduction to Contemporary Visual Arts. Art and Science. Contemporary Photography and Video and Social Science. Construction of the Gaze	Introduction to business models in urban environment	Introduction to digital fabrication - Safety at lab training - Rights and responsibilities	computer aided design: raster, vector, 3d design, parametric design, game engines and simulations. Autodesk Fusion		
W-2	Sept 18-22	Sentient city where every THING matter	Empirical urban theory in the UK: H. Mayhew, C. Buth		Models of urban systems management / Public private partnerships. NGOs in city planning	Project management principles - Final projects proposal - Web development - Creating a blog page			
W-3	Sept 25-29	Recording daily routing	Empirical urban theory in the USA: J. Addams, J. Pills, Chicago School of Sociology	visit to Moscow Museum of Contemporary Art	Value creation model for future cities. Value based management	assignment: modeling			
W-4	Oct 2-6		Anti-modernist planning movements: Ruskin, E. Howard, Unwin	visit to Moscow Multimedia Art Museum	"Distributed city" principles	laser and vinyl cutting: materials, marking, engraving, folding, press-fit constructions	computer aided design: Rhinoceros+gh		
W-5	Oct 9-13	When things are connected	Pro-modernist planning movements: - Reluctant modernism in the USA (F. Olmsted, T. Adams, D. Burnham); - Ildefonse Cerda - Functional City (Cornelis van Eestern, Le Corbusier) F.L.Wright: Broadacre City - Soviet avant-garde urban planning	Brief history of Visual Sociology. Approaches to visual anthropology.	Business models for the compact city. Urban sprawl	laser and vinyl cutting: materials, marking, engraving, folding, press-fit constructions - Assignment (create a structure)			
W-6	Oct 16-20	Rediscovering a domestic object	The New Urbanism		Smart cities as a new stage in the urban development	- 3d printing: principles, processes, machines and software, scales			
W-7	Oct 23-27		In search for urban communities after World War II: Ghetto, gentrification: Ruth Glass, Suburbs: Kenett Jackson, Jane Jacobs	Technical, Methodological and Safety introduction	Sustainable development and ecosystem services in urban planning. Brownfields.	3d printing: principles, processes, machines and software, scales - 3d scanning: principles, tools, output - Assignment: 3d scan and 3d print			
W-8	Oct 20 - Nov 3	Abstract modelling — identifying the essence	Politics, people and power in the city : Neo-marxism and urban theory - Henri Lefebvre	Recording city: human interactions in the city environment	Pros and cons of the eco-design and its economical impact	cnc milling: materials, scales, stock, tooling, speeds and feeds			
W-9	Nov 6-10		Ira Katznelson: 'Marxism and the city' David Harvey: Social Justice and the city / rebel cities, Harvey Molotch, The Los Angeles School of Urbanism (E. Soja)	Recording city: structures and movement in the city	Nature of the common good and its impact on city management	Multi-axis industrial robotic arms: safety, possible tools, mechanics, applications - Welding technologies - assignment: bigger structure			
W-10	Nov 13-17	Weaknesses and opportunities: understanding how to add value with technologies	Manuel Castells: 'City, class and power' / 'informationalism' / 'space of flows'	Understanding the city VS suburbs	Investments and urban systems	- Molding and casting: types, materials, processing, machining, software - Vacuum casting			
W-11	Nov 20-24		Global city: Saskia Sassen: 'Cities in a world economy' / Amin and Thrift	fieldtrip outside Moscow to suburbs/countryside	Techniques for analytical modeling (forecasting, optimization, simulation, decision analysis and classification)	composites: materials, fiber, matrix, processes			

		City Project: Things	Readings on Urbanity	Recording Sociology	New Business Models	Technologies: Things		Talks on Urban Innovation	KIDS Fab Lab
		Mon 15:00-21:00	Tue 18:00-21:00	Wed 18:00-21:00	Thu 18:00-21:00	Fri 15:00-21:00		Sat	Sun
		Andrey Yelbaev / Vicente Guallart / Elena Mitofanova	Nadia Khort	Sofia Gavrolova	Andrey Ptitsin	Ivan Mitrofanov			
W-12	Nov 27- Dec 1	Drafting design proposal	Postcolonial discourse: Cities of Global South	Recording city: diversity and identity in the city	Developing models for innovative businesses. Start-up models	Mechanical design: principles, tools, parts,materials - Assignment: make a machine	Programming classes: Arduino IDE, Processing		
W-13	Dec 4-8	Benchmarking similar projects	Urban Cultures, Sex in the city, The city as text, creative city	Recording the city: "non places"/ places of exclusions	Business models design and canvas development	Electronics and electricity basics - Electronics production: PCB fabrication, materials, milling, soldering, components, assembly - assignment: mill the PCB			
W-14	Dec 11-15	Prototyping	- Climate change and environmental risks: Christine Walmsler Cities, Disaster Risk and Adaptation (2014) - Terrorism and armed conflicts: Sophie Body-Gendrot 'Globalization, Fear and Insecurity: The Challenges for Cities North and South' (2012) - vulnerable infrastructures	Recording the city: borders and limits in the city	Aligning strategy and business models. Strategic plans	Electronics design: inventory, circuits, test equipment, software - assignment: make an electronic piece			
W-15	Dec 18-22		The information city: The networked metropolis, Big Data and the rise / and fall? of the smart cities	Individual project	Balanced scorecard / Lean startup methodology	Embedded programming: architecture, peripherals, memory, processors, languages, boards - assignment: program a board			
W-16	Dec 25-29		Colloquium		Lean startup methodology / Time value of money and cashflow management	Interface and application programming: languages, device, data and user interfaces, graphics, multimedia - Assignment: code an app			
W-17	Jan 1-5	>> HOLIDAYS >> HOLIDAYS >> HOLIDAYS >> HOLIDAYS >> HOLIDAYS >> HOLIDAYS >> HOLIDAYS >> HOLIDAYS >> HOLIDAYS >> HOLIDAYS >> HOLIDAYS >>							
W-18	Jan 8-12	Prototyping	Writing class	Individual project	Time value of money and cashflow management / Effectiveness and efficiency. Growth and development	Input devices: communication, switch, motion, distance, magnetic field, temperature, light, rotation - assignment: sensor device			
W-19	Jan 15-19				Porter's five forces analysis / Implementing new business models	Output devices: power supplies, LED, LCD,video, speakers, servo motors - assignment: output device			
W-20	Jan 22-26				Implementing new business models	Networking and communications: purposes, physical media, modulation - Assignment: connect devices			
W-21	Jan 29- Feb 2	Telling a story				- Electronics design and assembly practices			
W-22	Feb 5-9	Presentation	Essay Presentation and discussion	Exibition	Presenting business models	SEMESTER PROJECT			
	Feb 12-16	>> EXAMS / EXTRA WEEK >> EXAMS / EXTRA WEEK >> EXAMS / EXTRA WEEK >> EXAMS / EXTRA WEEK >> EXAMS / EXTRA WEEK >>							