

Integrating education with consumer behaviour relevant to energy efficiency and climate change at the universities of Russia, Sri Lanka and Bangladesh (BECK)

MODULE SPECIFICATION

Originating Institution, Department	Module Co-ordinator(s)
Peter the Great St.Petersburg Polytechnic	PhD, Senior Lecturer Julia Lednova
University, Higher School of Hydrotechnical	PhD, Associated Professor Oleg Stolyarov
and Power Engineering	Habilitated Professor Mikhail Shilin

TITLE OF THE MODULE

Title of the module	Module code ¹
Urban Development and Climate Change	

PROGRAMME(S) IN WHICH TO BE OFFERED:

Energy Efficient and Sustainable Building (International Education Program)
Civil Engineering (International Education Program)
Environmental Engineering(International Education Program)

LEVEL OF STUDIES²

CREDITS AND LEARNING HOURS

Credit Value ³	ECTS Value ⁴	Indicative academic learning hours ⁵	Length (in Semesters) ⁶	Year in which to be offered
6	6	190	1	1

ANNOTATION OF THE MODULE⁷

⁴ European Credit Transfer System, 1 ECTS = 25-30 academic learning hours. Please refer to



¹ To be indicated by the Institution

² According to the Framework of Qualifications for the European Higher Education Area, Annex 8: http://www.aic.lv/ace/ace_disk/Bologna/Bergen_conf/Reports/EQFreport.pdf

³ Permissible credit values as set out in Institution's Academic Regulations

ECTS Users' Guide: https://ec.europa.eu/education/ects/users-guide/docs/ects-users-guide_en.pdf ⁵ 1 academic learning hour is equal to 45 minutes

⁶ Indicate 0.5, 1, 1.5 or 2

⁷ Please provide brief summary of the module, up to 200 words



The integrated course considers the main points of climate change and urban development as the complex system, where surviving and successful development of cities are strongly related with environmental conditions and its changes inside of the system.

The course consists from four modules, related to reasons of climate change (natural and anthropogenic), trends in urban development, advanced materials and best practices of protection measures of cities in the coastal zone. First module considers natural and anthropogenic drivers of climate change with retrospective and current conditions are taken into account. Second module relates to urban development, to lessons learned in the system «climate-urban development» and concept of climate adaptation. Third module considers energy efficient materials to decrease energy consumption by proper material selection. The last module relates to development cities in the coastal areas as the most vulnerable and populated places in the World.

The course is developed, based on international experience, open free international data and best available technologies.

This course is developed in Modular Object-Oriented Dynamic Learning Environment (Coursera). The module is applicable for students, stakeholders and citizens involved or interested in urban development.

AIM OF THE MODULE⁸

To face to climate and reasons of its change and determine technologies and concepts to mitigate or prevent negative impact of climate change on urban areas, integrated with human behaviours and energy efficiency

MOOC LEARNING AND TEACHING STRATEGIES

The MOOC course has benefits for students, decision-makers, society and for everyone, who interesting in self-development.

- 1. Massive education: unlimited involved into the issue or just interested person can apply the course for education, business and self-development.
- 2. Boarders-free (global) education: online learning cut off any boarders between countries and time belts. MOOC course provide education 24/7 all year round within the schedule of course operation. It is not necessary to move far away from any place.
- 3. Digital openness: courses are available online.
- 4. Multi-technological materials: the MOOC course provides different formats of material presentation: video, audio and text versions of the course are available on the same platform and the same parts of the course.
- 5. No dependence on special time of classes / lessons.

At the same time, the MOOC system has the following disadvantages:

- 1. Educational atmosphere is «personalized»; traditional learning together provides social and communicational skills, especially in international team and reduces real feedback from knowledge.
- 2. Limiting individual consultancy: lack of individual or group training or discussion leads to decrease in feedback from the study.

⁸ Aim of the module must correspond to the BECK Capacity Building Framework





- 3. Health issues: spending time with PC/laptop/cell phone leads to health issue starting from headache and eyes-issues till psychological issues.
- 4. A high percentage of students' self-exclusion (including due to the lack of an external system for monitoring academic performance, and the level of assimilation of the material)
- 5. Impossibility to provide significant projects with many stages without reduction of quality of checking where human involving is necessary for consultancy.

Taken into account various approached, complexity of skill-development, advantages and disadvantages, the following teaching and learning strategies for implementation of the module are offered:

- focus on wide range of listeners
- flexible training schedule
- multi-skills development of listeners
- formation trends on lifelong education
- development the following soft skills: initiative, creative, able to self-educational and selfcontrol

Methods of learning and teaching of the course:

- Video lectures: every single lecture is represented in one or more video fragment. Total duration of each fragment of a lecture is up to ten minutes that makes it well understandable and easy-to-use for educational purposes. All the videos are supported with illustrative materials.
- Long reads: every lecture is represented in text version with wider explanation of a material and includes lots of illustrations. Within the set of videos listeners will find logical connection, which is represented in wider form in textual version.
- E-practical task: description of a practical task is represented in textual format with stepby-step explanation on the MOOC platform. It is orientated on hard skills formation.
- Testing of knowledge: each part of the module includes tests on knowledge evaluation as well as final test at the end of the course.

Learning outcomes are assessed using the balance of formative and summative assessment appropriate to the level of certification.

INTENDED LEARNING OUTCOMES AND ASSESSMENT

Learning Outcomes of the	Methods of studies	Assessment methods of student achievements ¹⁰	Assessment criteria o student achievements b assessment levels	of iy
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¹⁰ Please select from the list. Additional assessment methods may be added.

module ⁹			
O1. Able to analyze, connect and evaluate reasons of climate change in different areas, for decision making and for management consumers behaviors relevant to urban development and energy efficiency	Blended learning, integrated affective tutoring.	 Problematic questions Intelligent tests Regular tests Problematic tasks Projects Peer evaluation Automated feedback Final evaluation Other: practical task 	Threshold achievement levelKnows natural and human- caused reasons of climatechange and maininternational documentsdetermined climate changebut in not able to connectand evaluate trends ofclimate change on any partof the globe and provide adecision-making onconsumers behaviors andurban developmentTypical achievement levelAble to evaluate andconnect parameters andtrends of climate change onany part of the globeExcellent achievement levelAble to analyze, connect andevaluate reasons of climatechange on any part of the globe and provide variantsfor management ofconsumers behaviors andprobable direction of urbandevelopment for the changing conditions
O2. Able to analyse, compare and evaluate relationships between historical urban development, urban planning and climate conditions and for development	Blended learning, integrated affective tutoring.	 Problematic questions Intelligent tests Regular tests Problematic tasks Projects Peer evaluation Automated feedback Final evaluation Other: calculation task 	Threshold achievement level Knows the differences between epochs, urban development and climate change. Knows on human- induced transformation of urban climate but not able to evaluate human impact on urban climate transformation and propose suitable climate mitigation technologies

⁹ Learning outcomes are specified in three categories – as **knowledge**, **skills and competence**. This signals that qualifications – in different combinations – capture a broad scope of learning outcomes, including theoretical knowledge, practical and technical skills, and social competences where the ability to work with others will be crucial. Please refer to Cedefop (2017). Defining, writing and applying learning outcomes: a European handbook. Luxembourg: Publications Office of the European Union. <u>https://www.cedefop.europa.eu/files/4156_en.pdf.</u> Learning outcomes of the module must correspond to the BECK Capacity Building Framework.

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technologies			Able to analyze, compare and evaluate climate conditions and appropriate type of urban development for different areas. Knows on climate mitigation technologies but not able to develop it <i>Excellent achievement level</i> Able to analyze, compare and evaluate climate conditions and appropriate type of urban development for different areas. Able to develop climate mitigation technologies for different
O3. Able to analyze basic features of structure, properties and application of environmentally friendly building materials and apply these to proper	Blended learning, integrated affective tutoring	 Problematic questions Intelligent tests Regular tests Problematic tasks Projects Peer evaluation Automated feedback Final evaluation Other: activity 	Climatic conditions Threshold achievement level Knows on basic features of structure, properties and application of environmentally friendly building materials but can't apply it to proper selection for civil and geotechnical engineering tasks
selection in specific civil and geotechnical engineering tasks		assessment	<i>Typical achievement level</i> Able to analyze basic features of structure, properties and application of environmentally friendly building materials and knows on general principles for selection and application in specific civil and geotechnical engineering tasks
			<i>Excellent achievement level</i> Able to analyze basic features of structure, properties and application of environmentally friendly building materials and apply these to proper selection in specific civil and geotechnical engineering tasks



O4. Able to analyse	Blended learning,	Problematic questions	Threshold achievement level
and recommend	integrated affective	Intelligent tests	Knows on impact climate
climate change	tutoring.	Regular tests	change on a coastal area and
mitigation		Problematic tasks	main cases of environmental
technologies for a		Projects	risks. But not able to choose,
coastal area		Peer evaluation	analyze and recommend
		🔀 Automated feedback	climate change mitigation
		Final evaluation	technologies
		Other:	Typical achievement level
			Able to analyse various
			climate change mitigation
			technologies for a coastal
			area, but can't recommend a
			particular technology to
			mitigate negative impact of
			climate change
			Excellent achievement level
			Able to analyse and
			recommend climate change
			mitigation technologies for a
			coastal area

MODULE MARK CALCULATION¹¹:

Assessment co	mponents (in ch	ronological or	der of submission/ex	amination date)
Type of		Duration	Word count (if	Component pass
assessment ¹²	Weighting, %	(if exam)	essay or similar):	required
Assessment of the				
degree of	2001			
interaction and	20%			Yes 🔄 No 🔀
participation of the				
students				
Calculation task	30%			Yes 🔀 No 🗌
Intermediate tests	30%			Yes 🔀 No 🗌
Online examination	20%	20 minutos		
(test)	2070	20 minutes		
Total:	100%			

SYLLABUS OUTLINE

¹³ Indicate Yes to specify the assessment component(s) to be passed in order to pass the module





¹¹ Please list all components, sum must be equal to 100%. Note that successful course completion should be recognised as indicating worthwhile educational achievement.

¹² Please indicate in chronological order of submission date each assessment component by type, e.g. examination, home work, coursework, project



No.	Topic ¹⁴	Number of hours ¹⁵
	Introduction to the module	5
1.	Module 1. Climate change: trends and sustainable development	
1.1.	Climate and climate change. Climate change: natural reasons	15
1.2.	Climate change: artificial reasons	15
1.3.	Climate change: indicators of climate change and international	15
2	Modulo 2. Urbanization monto elimeto ebenero	
2.		45
2.1.	Urbanization: cities development and trends	15
2.2.	Urbanization: development vs climate change	15
2.3.	Concept of climate change adaptation for urban territories	15
3.	Module 3. Construction and building materials for a city of the	
	future	
3.1.	The importance of developing new types of materials (from	10
	reinforced concrete to composites)	
3.2.	Types of prospective building materials for sustainable urban	10
	development	
3.3.	Fiber-reinforced concrete	10
3.4.	Textile-reinforced concrete	10
3.5.	Geosynthetics	10
4.	Module 4. Dredging against global warming	
4.1.	Prospects for urban development in reclaimed coastal areas and	15
	artificial islands	
4.2.	Protection of urban coasts	15
4.3.	Control of floods	15
	Total:	190

LEARNING MATERIALS¹⁶

Core materials (up to 5 references):

- 1. Anand S.V. (2013) Global Environmental Issues. Issue 2: 632, DOI: 10.4172/scientificreports.632
- Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities. A Global Assessment (2013), (Eds.) T. Elmqvist, M. Fragkias, Ju. Goodness, B. Güneralp, P.J. Marcotullio, R.I. McDonald, S. Parnell, M. Schewenius, M. Sendstad, K.C. Seto, C. Wilkinson, 771 p. DOI: 10.1007/978-94-007-7088-1
- 3. Gries, T., Raina, M., Quadflieg, T. and Stolyarov, O. (2016) 'Manufacturing of textiles for civil engineering applications', *in Textile Fibre Composites in Civil Engineering*. Elsevier, pp. 3–24.
- 4. Bray R.N. (ed.) (2008) Environmental aspects of dredging, Taylor and Francis, 386 p.
- 5. Laboyrie H.P. (ed.) (2018) Dredging for sustainable infrastructure, CEDA IADC, 312 p.



¹⁴ Please add as many topics as needed

¹⁵ Includes self-learning, on-line conferences and consultations

¹⁶ Courses should provide high quality materials to enable an independent learner to progress through selfstudy. Materials should make best use of online affordances (interactivity, communication, collaboration) as well as rich media (video and audio) to engage students with their learning.



Supplementary materials (up to 10 references):

- 1. Hulley, M.E. (2012) The urban heat island effect: causes and potential solutions, Metropolitan Sustainability. Understanding and Improving the Urban Environment, *A volume in Woodhead Publishing Series in Energy*, pp. 79-98.
- 2. Jalali, N. M., Massoud, M. (2015) Urban Landscape and Climate, *Special Issue of Curr World Environ.*, vol. 10, Special Issue, pp. 302-312, DOI: 10.12944/CWE.10.Special-Issue1.39
- 3. Chapman, S., Watson, J.E.M., Salazar, A. et al. (2017) The impact of urbanization and climate change on urban temperatures: a systematic review, *Landscape Ecol.*, vol. 32, pp. 1921–1935, DOI: 10.1007/s10980-017-0561-4
- 4. Oke, T.R. (1988) Street design and urban canopy layer climate, *Energy and Buildings*, Vol. 11 (1–3), pp. 103–113. DOI: 10.1016/0378-7788(88)90026-6
- 5. Janhäll, S. (2015) Review on urban vegetation and particle air pollution Deposition and dispersion, *Atmospheric Environment*, Vol. 105, pp. 130-137.
- 6. Alizadeh B., Hitchmough, J. (2019), A review of urban landscape adaptation to the challenge of climate change, *International Journal of Climate Change Strategies and Management*, Vol. 11 No. 2, pp. 178-194. DOI: 10.1108/IJCCSM-10-2017-0179
- Shukla S.K. Handbook of Geosynthetic Engineering: Second edition. ICE Publishing, 2012. 424 p.
- 8. Koerner, R. M. (2016), Geotextiles: From Design to Applications, Woodhead Publishing Co., Amsterdam, 617 p. <u>https://doi.org/10.1016/C2014-0-00669-7</u>

On-line resources¹⁷:

- 1. Science and information for a climate-smart nation: https://www.climate.gov/
- 2. National centers for environmental information: https://www.ncdc.noaa.gov/
- 3. World Meteorological Organization: https://public.wmo.int/en
- 4. World Population Review: https://worldpopulationreview.com/
- 5. The Intergovernmental Panel on Climate Change: https://www.ipcc.ch/

Other materials:

Lecture materials available at the Moodle (Coursera), BECK Simulated Big Data Interuniversity Networked Affective Educational Centre.

REQUIRED IT RESOURCES¹⁸

No.	Software, manufacturer
1.	MS Word
2.	MS Excel
3.	MS Power Point
4.	Adobe Acrobat reader

Date of completion of this version of Module Specification

Date of approval by the Faculty:

¹⁷ Please provide links



¹⁸ Please add as many software as needed for the course



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