

## Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area (CENEAST)

### MODULE SPECIFICATION

Module Title: <b>Renewable energy</b>			University module code:	
Level <sup>i</sup> : <b>Bachelor</b>	Credit Value <sup>ii</sup> :	ECTS Value <sup>iii</sup> : <b>5</b> (in Russia 1 ECTS equals to 36 hours of work load)	Length (in Semesters) <sup>iv</sup> <b>1</b>	Semester(s) in which to be offered:
New module <sup>v</sup> :	Title of Module being replaced ( <i>if any</i> ):		With effect from <sup>vi</sup> :	
Originating School: <b>KSTU, NTUU "KPI"</b>		Module Co-ordinator(s): <b>KSTU</b>		
Programme(s) in which to be offered:				
Pre-requisites ( <i>between levels</i> ):			Co-requisites ( <i>within a level</i> ):	
Indicative learning hours:		Percentage taught by School(s) other than originating School <sup>vii</sup> :		
<p>Aims of Module:</p> <ul style="list-style-type: none"> <li>• Get knowledge about the ecology - energy problems caused by globalization of the world economy, the negative impact of energy, based on non-renewable sources of energy: oil, gas, coal, nuclear energy, the environment.</li> <li>• To familiarize students with the technical terminology and classification used in the module "Renewable energy sources".</li> <li>• The acquisition of knowledge in the evaluation are available for the use of renewable energy resources and climate impacts of their widespread use.</li> <li>• Getting knowledge of current and emerging technologies in the world production of electric and heat energy for the needs of the world economy based on renewable energy: solar energy, wind energy, large-scale and small-scale hydropower, tidal and ocean energy, bio-energy, geothermal energy.</li> <li>• Getting in-depth knowledge of the accumulation and transfer of energy from renewable energy sources.</li> <li>• Getting knowledge about the political framework conditions aimed at promoting renewable energy.</li> <li>• The acquisition of knowledge and skills to assess the cost-effectiveness of renewable sources of energy.</li> <li>• The course is expected during the group discussions via the Internet / Skype (50% of the evaluation are interpersonal skills).</li> </ul>				
Intended Learning Outcomes				
<u>Knowledge and Understanding</u>				
On successful completion of this module, a student will be able to:				

- Understand the environmental and energy problems of the world economy is currently based mainly on non-renewable sources of energy.
- To learn and apply the technical terminology used in the module "Renewable energy sources".
- Apply knowledge in the assessment are available for the use of renewable energy resources and assessment of climate impacts of their widespread use.
- Detailed information on the state of contemporary and emerging technologies in the world production of electric and heat energy for the needs of the world economy based on renewable energy.
- Understand the political framework conditions aimed at promoting renewable energy.
- Apply theoretical and practical knowledge in solving problems on the accumulation and transfer of energy from renewable energy sources and receivers of energy.
- Apply knowledge in the calculation of economic efficiency in the use of renewable energy sources.

Transferable/Key Skills and other attributes

On completion of the module a student will have had the opportunity to:

- Participate in group discussions and presentations via the internet
- Use Computer Learning Systems
- Exercise of initiative and personal responsibility

Module mark calculation:<sup>viii</sup>

Assessment components (in chronological order of submission/examination date)

Type of assessment <sup>ix</sup>	Weighting%	Duration (if exam)	Word count (if essay/dissertation):	Component pass required <sup>x</sup>
<b>Assessment of the degree of interaction and participation of the students</b> (50% mark attributed to soft skills)	30%		n/a	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
<b>Final assessment component</b> Written Group Essay	70%		6000	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

Learning and teaching strategies<sup>xi</sup>:

The core of the module material is a substantial body of tutors written notes and exercises located on Moodle. These incorporate interactive self- and tutor assisted formative assessment exercises. Students are directed to additional resources available online, for example in legal databases, including ScienceDirect, Scopus, the e-library, etc.

Teaching and learning will occur through moderation of forum discussion for the preparation of papers. In addition, in order to foster cohort cohesion, counteract the isolation of distance learning, and provide opportunities to reflect, practise reasoning skills and obtain further formative feedback, students will be encouraged to participate in on-line discussions, peer reviews and group work. (compulsory participation in forum discussion).

Summative assessment involves students applying their knowledge of smart built environment to a practical situation and producing a piece of coursework of 6,000 words, applying critical analysis of the smart built environment from different perspectives (see Aims of Module). Formative group sessions will be held online.

**Moodle Virtual Learning Environment (VLE):**

All students will be supported by extensive use of the Moodle virtual environment. The programmes utilise an e-based learning strategy to support delivery. The method adopts the following principles:

1. High quality integrated module content that combines a variety of types of information supporting the learning objectives of the module
2. Internet-based communication and submission of assessed work
3. On-line tutorial support during module delivery

**Syllabus outline:**

- Introduction to the module;
- Classification of primary energy resources and their evaluation;
- Concepts, *theories* and *perspectives* of smart built environment;
- Technologies for the use of solar energy;
- Technologies for the use of wind energy;
- Technologies for a large and small hydropower;
- energy technologies and ocean tides;
- Technology use of bioenergy;
- Technologies for the use of geothermal energy;
- Environmental aspects and climatic factors in the use of renewable energy;
- Political framework conditions for international legal frameworks, focused on the promotion of renewable energy;
- Cost-effectiveness of renewable sources of energy.

**Indicative texts and/or other learning materials/resources:**

**Core text:**

**- from the electronic library EBSCOhost**

1. Ghosh, Tushar K. Energy resources and systems. Vol. 2 : Renewable resources, 2011
2. Fuchs, Ewald F. Power conversion of renewable energy systems, 2011
3. Aldo Vieira da Rosa. Fundamentals of Renewable Energy Processes (Third Edition), 2013
4. Bansal, Ramesh C. Handbook of Renewable Energy Technology, 2011

**- proposed by the authors of the module**

5. Sibikin YD Non-conventional renewable energy sources / Sibikin Yu.D. Sibikin M. YD // SP Radio Moscow: .2009. -232c.
6. The Future for Renewable Energy: Prospects and Directions. 2002. Vol. 2. London: EURES Agency. 250 p.
7. Bezrukikh pp. / Resources and the effectiveness of renewable energy sources in Russia // PP Bezrukikh and other // St. Petersburg. Nauka, 2002. S314.
8. Yelistratov VV Climatic factors renewable energy / Yelistratov VV, Kobysheva NB, Sidorenko GI // St. Petersburg. - Science.: 2010.-s.235s.
9. Belay VF Environmental aspects of energy / Belay VF, VA Shkitsky //. Monograph. - Kaliningrad: Publishing House of Kazan State Technical University, 2004 - S. 81.
10. Belay VF Wind power Russia: analysis of scientific, technical and legal problems / VF Belay, A. Nikishin // Elektrichestvo.-2011. - № 7. - C 7-14.

**Recommended text:**

**- from the electronic library EBSCOhost**

1. Wagner, Hermann-Josef. Introduction to hydro energy systems, 2011
2. Kopsakangas-Savolainen, Maria. Modern energy markets, 2012
3. Nasir El Bassam. Distributed Renewable Energies for Off-Grid Communities, 2013
4. Cho, V. G. Handbook of Sustainable Energy, 2010
5. Fanchi, John R. Energy in the 21st Century, 2011
6. Smith, Zachary A. Renewable and Alternative Energy Resources : A Reference Handbook,

2008

7. Øverland, Indra. Russian Renewable Energy : The Potential for International Cooperation, 2009
  8. Gupta, Harsh K. Geothermal Energy : An Alternative Resource for the 21st Century, 2007
  9. Chen, C. Julian. Physics of Solar Energy, 2011
  10. Labouret, Anne. Solar Photovoltaic Energy, 2010
  11. White, Liam G. Solar Energy Technologies : From Research to Deployment, 2010
  12. Tiwari, G. N. Solar Energy : Fundamentals, Design, Modelling and Applications, 2006
- proposed by the authors of the module**
13. The energy resources of the USSR. Hydropower resources / A.B.Avakyan [etc.], ed. A.N.Voznesenskogo. - Moscow: Nauka, 1967.
  14. PP Bezrukikh Renewable Energy: Strategy, resources, technology / P.P.Bezrukikh, D.S.Strebkov; GNU VIESH. - Moscow, 2005. - 264 p.
  15. Climate Russia. - St. Petersburg. Gidrometeoizdat, 2001. - 655.
  16. Nikolaev VG The National Inventory of wind energy resources in Russia and methodological basis for their determination / V.G.Nikolaev, S.V.Ganaga, Yu.I.Kudryashov. - M.: ATMOGRAPH, 2008.-584 with.
  17. Al Shefter The use of wind / A.I.Shefter. - M.: Energy, 1975.-177 with.
  18. Hydropower and integrated water resources of the USSR / red. PSNeporozhny. - Énergoizdat, 1982. - 560.
  19. Chao P., Wood A.W. Water management implication of global warming. 7. The Great Lakes - St.Lawrence River Basin / Institute for water Resources. U.S.Army Corps of Engineers. VA, USA, 1999. - 102 p.
  20. Climate change impacts on runoff and hydropower in the Nordic countries / NRSaelthun, P.Aittoniemi, S.Bergstrom // TemaNord. 1998,552.
  21. bioclimatic potential of Russia: theory and practice / AV Gordeev [et al.] - M., 2006. - 516 p.
  22. Guidelines for the evaluation of the effectiveness of investment projects (second edition). - Moscow: Economics, 2000. - 421 sec.
  23. Cooks OA Development of geothermal energy in Russia and abroad / O. Cooks, GV Tomarov // Small power. - 2005. - № 1-2. - S. 84-98.
  24. Belay V.F.Vozobnovlyaemye energy sources and prospects for their use in the Kaliningrad region / VF Belay, V.V.Selin, V.F.Parshina // News KSTU. - 2007. - № 11. - S. 11-21.
  25. Celine V. On the question of the development of the concept of the use of biofuels in the energy balance of the Kaliningrad region / V.V.Selin // electric. - 2006. - № 8. - S. 9-12.
  26. Hydropower: a textbook for high schools / ed. V.I.Obrezkova. - 2nd ed., Rev. and add. - M. Energoatomizdat, 1998.
  27. Hydroelectric power low power: studies, the benefit / A.E.Andreev, Ya.I.Blyashko, V.V.Elistratov and others, ed. V.V.Elistratova. - St. Petersburg.: Publishing House of the Polytechnic University Press, 2005.
  28. Grafenberger P., Losbichler L. Hydropower & Dams. «Update on the large bulb units for the Sihwa tidal plant in Korea», 2009.
  29. Handbook of Photovoltaic Science and Engineering, Second Edition / Antonio Luque, Steven Hegedus, 2011 John Wiley & Sons

**Journals:**

Renewable & Sustainable Energy Reviews

<http://www.journals.elsevier.com/renewable-and-sustainable-energy-reviews>

Renewable Energy An International Journal

<http://www.sciencedirect.com/science/journal/09601481>

Renewable Energy Focus

<http://www.elsevier.com/journals/renewable-energy-focus/1755-0084>

International Journal of Renewable Energy Research (IJRER)

<http://www.ijrer.org/index.php/ijrer>

**On-line resources:**

Renewable energy world <http://www.renewableenergyworld.com/rea/home>

The European Wind Energy Association | EWEA <http://www.ewea.org/>

World Wind Energy Association <http://www.wwindea.org/home/index.php>  
ISES International Solar Energy Society <http://www.ises.org/index.html>  
International Hydropower Association <http://www.hydropower.org/>  
Institute for Energy Research <http://www.instituteforenergyresearch.org/>

Date of completion of this version of Module Specification .....

Date of approval by the Faculty Programme Approval and Review Sub-committee: .....

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- i indicate level (e.g. first, second or third cycle; sub-level if applicable). All qualifications in the European Higher Education Area are located within three cycles - undergraduate; graduate and doctoral studies*
  - ii permissible credit values as set out in Institution's Academic Regulations*
  - iii European Credit Transfer System*
  - iv indicate 0.5, 1, 1.5 or 2*
  - v delete as applicable*
  - vi insert month and year of first/next delivery of module*
  - vii identify all participating Schools other than Originating School*
  - viii To be defined*
  - ix please indicate, in chronological order of submission date, each assessment component by type, e.g. examination, oral, coursework, project, dissertation*
  - x indicate Yes to specify the assessment component(s) to be passed in order to pass the module*
  - xi please note the requirement to give full consideration to issues of equality, diversity and accessibility*