

The MidtermExam program
on the discipline «**Physics and Technology of Energy Saving and Renewable Energy**» for
doctoral students 1 course of specialty «5D060400 – Physics »

The proposed MidtermExam program on discipline «**Physics and Technology of Energy Saving and Renewable Energy**» is made according to the discipline syllabus. The program determines the requirements for the levels of mastering the academic discipline: what the student should have *an idea* after studying the course for 7 weeks, which should know what *skills* and *habits* should be formed.

At MidtermExam, students will be asked two theoretical questions and one task.

Midterm addresses the following questions:

1. Traditional and non-traditional sources of energy.
2. Basic relations of fluid and gas mechanics. Application of the laws of thermodynamics.
3. Physical basis of solar energy conversion processes.
4. Physical principles of solar thermal energy converters
5. Thermal energy storage.
6. Thermal solar systems for obtaining cold, for heating rooms and air drying.
7. Use of solar radiation for cooking and fresh water.
8. Systems of solar heat supply.
9. Transformation of thermal solar energy into mechanical and chemical energy.
10. Stirling engines. Solar power plants of a tower type and with dispersed collectors.
11. Photovoltaic properties of p-n junction. Electronic properties of semiconductor materials.
12. Conversion of thermal solar energy into electrical energy by semiconductor converters.

BIBLIOGRAPHY

Basic:

1. Aitken, Donald W. (2010). Transitioning to a Renewable Energy Future, International Solar Energy Society, January, 54 pages.
2. Lovins, Amory (2011). Reinventing Fire: Bold Business Solutions for the New Energy Era, Chelsea Green Publishing, 334 pages.
3. Makower, Joel, and Ron Pernick and Clint Wilder (2009). Clean Energy Trends 2009, Clean Edge.
4. HM Treasury (2006). Stern Review on the Economics of Climate Change, 575 pages.
5. International Energy Agency (2007). Renewables in global energy supply: An IEA facts sheet, OECD, 34 pages.

Additional literature:

1. REN21 (2008). Renewables 2007 Global Status Report, Paris: REN21 Secretariat, 51 pages.
2. REN21 (2009). Renewables Global Status Report: 2009 Update, Paris: REN21 Secretariat.
3. REN21 (2010). Renewables 2010 Global Status Report, Paris: REN21 Secretariat, 78 pages.
4. United Nations Environment Programme and New Energy Finance Ltd. (2007). Global Trends in Sustainable Energy Investment 2007: Analysis of Trends and Issues in the Financing of Renewable Energy and Energy Efficiency in OECD and Developing Countries, 52 pages.
5. Worldwatch Institute and Center for American Progress (2006). American energy: The renewable path to energy security, 40 pages.