Master Course on Renewable Energy Sources and Sustainable Environment

Curriculum:

Innovative Technologies and Solution of Energy Supply

Turin Polytechnic University in Tashkent

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Course Syllabus

Part I Course Overview

Course Title	Innovative Technologies and Solution of Energy Supply
Course-level	Post-graduate studies
Course type	Academic
Credit Units	#
Field of study	Renewable Energy Sources and Sustainable Environment
Course structure	Lecture – 16 hours Practice – 16 hours Laboratory – 16 hours
Course prerequisites	Energy production and supply, Environmental pollution & engineering, Electrical circuits, Fundamentals of Hydraulic machines and technologies, Basic knowledge of Physics, Thermodynamics, Fuels and Combustions Technology, Information technology basics
Medium of instruction	English
Goals and objectives of the course in terms of competences and skills	The aims of the course are as follows: 1. To get knowledge about innovative energy supply technologies at production, supply and users sides; 2. Conformity of innovative energy supply technologies to innovative concepts; 3. Environmental impacts of innovative technologies; 4. Suitability of innovative energy supply technologies to local and regional energy market; 5. Intellectual properties strategies and application of patents and trademarks.
Content	"Innovative Technologies and Solutions of Energy Supply" is focused on definition, expertise of innovation principles and criteria, protection of intellectual and commercial properties (patents, trademarks, designs, etc.), selection and transfer of innovative technologies into real facilities acc. to the energy supply system needs.
Learning outcomes	By attending this programme, one will achieve high level of education attaining advanced knowledge and skills in designing and managing conventional and innovative systems for generation, distribution and use of energy, and receive models as well. More specifically, one will gain professional capabilities oriented to: 1. Techno-economic analysis and benchmark of innovative technologies; 2. Outlook of technologies and solutions for the energy sector; 3. Design, selection and operation of conversion plants from both conventional and renewable energy sources; 4. To understand the basic costs of the different technologies; 5. Understand the energy system status quo: industrial architecture, supply chain, incumbent dominant technologies, uses and users, pricing mechanisms, regulation; 6. Know how to derive practical supply and demand curves for a specific market.

Part II Lecture Course Outline

Theme	Hours
1. Basic Energy Terms and Conversions: • Introduction, Course Outline and Objectives, Energy vs. Power, Conversion, Laws of Thermodynamics, Stocks and Flows, Costs vs. Price.	2
2. Evaluating Macroeconomic Impacts: • Balance of payments ,Impacts of external shocks (Price and Supply) ,Accounting for energy adjustment ,GDP and energy consumption ,Energy consumption and energy price.	4
3. Intellectual and commercial property. Patenting procedure for innovative energy ideas.	4
4. Energy Supply Analysis and Supply Projection: • Energy resource assessment, Renewable domestic resources, and International supply, Hydropower Supply: Analysis Demand forecast and generation expansion plans, Biomass supplies Analysis: Forecast and non-forest products, forest stocks-yield and area relationship, growth rules, and analysis of other source of fuelwood, analysis of agricultural residue and animal dung, Energy option technology evaluation.	4
5. Climate Change & the Impact of Energy Systems Greenhouse gas effect, International Climate Government, ETS Trading System, Carbon Pricing.	2
TOTAL	**16**

Part III Practical Course Outline

Theme	Hours
1. Heat transfer and the laws of thermodynamics	4
2. AC/DC power generation	4
3. Design and calculation energy storage systems	4
4. Energy Conservation calculations	4
TOTAL	**16**

Part IV Laboratory Course Outline

Theme	Hours
1. Experiment on heat transfer	4
2. Case studies and energy scenarios planning using professional software like Long Range Energy Alternative Planning System (LEAP), Market Allocation (MARKEL) etc.	12
TOTAL	**16**

Part V Course Description

Abstract	This course will introduce a range of energy management, especially with management in energy sector engineering. Fundamentals of product strategy management. Studying methods of energy accounting and energy auditing in energy sector, industry and final consumption. Finding opportunities to increase the rational use of renewable energy resources.
Actuality	The management of technology and innovation is an issue that faces all firms today. The waves of change in the business environment include new technologies and innovations that force industries and firms to find new ways to compete and to survive. Just as a storm of new products seems to be emerging rapidly, new ways of doing things are emerging to help firms be more efficient and effective. To meet these waves of change, business must find ways to manage technology and innovation. This course will equip students with required knowledges of renewable energy management and supply, so will fill the current gaps of energy sectors.
Recommended literature	1. Kolanowski, Bernard F. Guide to Microturbines, The Fairmont Press, Inc., 2004. 2. O'Hayre R., Cha S.W., Colella W. and Prinz F.B. Fuel Cell Fundamentals, Wiley, 2005. 3. Tiwari G.N. Solar Energy: Fundamentals, Design, Modelling and Applications, Narosa Publishing House, New Delhi, 2004. 4. R.Burgelman, C.Christensen, S.Wheelwright. Strategic Management of Technology and Innovation, 2008. 5. R.G. Cooper, S.J. Edgett. Product Innovation and Technology Strategy, 2009. 6. J.J. Mohr, S. Sengupta, S. Slater. Marketing of High-Technology Products and Innovations, 2009. 7. M. A. White, G.D. Bruton. The Management of Technology and Innovation: A Strategic Approach, 2006. 8. B.Gou, W.Ki Na, B.Diong. Fuel Cells: Modeling, Control, and Applications, 2009. 9. M.Noh. Reactive Transport Modeling: Reactive Transport Modeling in Fractures and CO2 sequestration, 2009. 10. S.M. McJohn. Intellectual Property: Examples & Explanations, 2008. 11. M.A.Golli, Driving Innovation: Intellectual Property Strategies for a Dynamic World, 2008.