

Course File

Session-2016- Semester Spring 2020

ME - 414 Energy Resources & Utilization

Instructor

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Department of Mechanical Engineering

**University of Engineering & Technology
Lahore. (KSK Campus)**

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BSc. Mechanical Engineering (Session – 2016)

8th Semester

B.SC. Mechanical Engineering Course Skeleton				
Course: Energy Resources and Utilization	Name of Instructor: Dr. Muhammad Farooq	Class 2016	Semester 8th	Duration Jan - Jun, 2020
Credit hours:	(Theory) 2	Class Timings: Tuesday 01:00 pm – 3:00 pm Section A Thursday 10:00 am – 12:00 Section B		
Course Outline: Mineral energy resources, fossil fuels in solid, liquid and gaseous states. Renewable energy resources, nuclear energy. Hydro-electric power, solar energy, fuel, cells, wind powers, wave and tidal power, geothermal energy, environmental impact, assessment of alternative energy sources energy storage systems. Energy analysis, principles of energy analysis, energy analysis methodologies, statistical analysis, input/output table techniques and process energy analysis, case studies, alternative chemical fuel, buildings, electrical power generation. Energy and economics, projecting appraisal techniques, energy investment and the discount rate, cost benefit assessment of alternative energy sources economic versus energy analysis. Energy and society: The technology-society relationship. Alternative (Advanced versus intermediate technologies and their social implications. Government influence on energy demand energy and the thin energy conservation, Scope, techniques and optimization of energy system designs, energy system modeling etc.				
Books and references: <ol style="list-style-type: none">1. Renewable Energy Resources by John Twidell , Tony Weir2. Renewable Energy by Godfrey Boyle3. Sustainable Energy – Choosing among options by Tester, Driscoll, Golay				

Components of Assessment:

Assessment during the semester (Quizzes and CEP) = 30 marks

Mid Term = 30 marks

End Term Examination = 40 marks

Total = 100 marks

Course Outline (Week and Lecture Wise)

Week No.	Course Content to be Covered		
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1	Introduction	Renewable and fossil fuels, Introduction to Renewable Energy Technologies, Current World Energy Trends, Introduction to Coursework / CEP.	CLO1 / PLO1 covered
2	Solar Energy	Introduction to solar energy, current status of solar energy utilization, basic phenomenon, Solar water heating, Building application of solar energy, Discussion	CLO1/PLO1 covered
3	Solar Concentrators, & Photovoltaic	Explain the working principles for solar concentrators and their application, working principle of Solar photovoltaic, their types and applications.	CLO1 / PLO1 covered
4	Wind Energy	Introduction to wind energy, Current status of wind energy utilization, wind power curve, Wind turbines, their types and working principles	CLO1/PLO1 covered
5	Tidal Energy (Quiz 1)	Introduction to Tidal Energy, Utilization of tidal energy, current status	CLO1/PLO1 covered
6	Geothermal Energy	Introduction to Geothermal Energy, Utilization of geothermal energy, current status	CLO1/PLO1 covered
7	OTEC	Introduction to OTEC Discussion relevant to all energy resources covered after midterm exams	CLO1/PLO1 covered
8	Hydro Electric Energy	Introduction to Hydro Electric Energy, Utilization of Hydro Electric Energy, current status	CLO2/PLO2 covered
9	Mid Term Examination		

ODL Lecture Plan (7 Lectures)

		ODL Lecture Plan (7 Lectures)	
10	Lect. No. 1 Bioenergy	Introduction to bioenergy, Classification of biofuels, Explain the various processes used in the utilization of biomass. http://sustainable-energy-research.weebly.com/uploads/2/9/3/8/2938513/lec._4_biomass.pdf	CLO1/ PLO7
11	Lect. No. 2 Hybrid Energy Sources	Hybrid energy sources status of Pakistan: An optimal technical proposal to solve the power crises issues http://sustainable-energy-research.weebly.com/uploads/2/9/3/8/2938513/hybrid_energy_sources_status_of_pakistan- an_optimal_technical_proposal_to.pdf	CLO2/PLO6
12	Lect. No. 3 Carbon capture for sustainable environment	What is CCS, How CO ₂ is captured, technologies for CO ₂ capture, Pre-post and oxy combustion systems, Underground geological CO ₂ storage, Applications http://sustainable-energy-research.weebly.com/uploads/2/9/3/8/2938513/lect.5b1_carbon-capture-and-storage.pdf	CLO3 / PLO7
13	Lect. No. 4 Energy Management and Auditing	Introduction to Energy management, energy auditing, steps in energy management, review of energy management systems, applications, ISO50001 http://sustainable-energy-research.weebly.com/uploads/2/9/3/8/2938513/energy_auditing.pdf	CLO3 / PLO7
14	Lect. No. 5 Energy Efficiency In Buildings Methodology	Typical energy flow in buildings, Determining a building's energy performance, Benchmarks, Certifying energy efficiency http://sustainable-energy-research.weebly.com/uploads/2/9/3/8/2938513/energy_efficiency_in_buildings_methodology_.pdf	CLO3 / PLO7
15	Lect. No. 6 Energy policy & economy	Development of energy policy, key roles in the development of a corporate energy policy, Analyzes policy options for addressing renewable energy development, environmental sustainability, and green growth. Seven steps for energy management https://elearning-adbi.org/courses/energy-economics-environment-and-policy/	CLO3 / PLO7

		http://sustainable-energy-research.weebly.com/uploads/2/9/3/8/2938513/module_4_developing_a_n_energy_policy.pdf http://sustainable-energy-research.weebly.com/uploads/2/9/3/8/2938513/module_9_7_steps_for_energy_management.pdf	
16	Lect. No. 7 Case Studies	<p>Case studies will be discussed and solved to design energy systems to meet specific energy demand.</p> <p>CASE STUDY 1. Sustainable energy authority in Australia</p> <p>CASE STUDY 2. Improving energy efficiency in Ekurhuleni Metropolitan Municipal (EMM) buildings, South Africa</p> <p>CASE STUDY 3. Efficient lighting in the Latvian Academy of Sport Education (LASE), Latvia</p> <p>CASE STUDY 4. Passive design in local government offices of Ireland</p> <p>http://sustainable-energy-research.weebly.com/uploads/2/9/3/8/2938513/energy_efficiency_in_buildings_book.pdf</p>	CLO3 / PLO7
17	End Term Examination		



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Energy Resources and Utilization

Sr. No.	CLO Statement	Domain		Taxonomy level	PLO
1.	Explain the fundamental of renewable energy resources and their differences compared to non-renewable resources.	Cognitive	C.P. 1 (10%) Quiz 1 (10) + Mid Term (10)	2	1
2	Design an economically feasible renewable/hybrid energy systems meeting specific energy demands, with minimal impact on the environment.	Cognitive	C.P. 2 (10%) +Quiz 2 (10) +Mid Term (20)	4	6
3.	Analyze the key energy economics issues, policy options for addressing renewable energy development, environmental sustainability, and green growth.	Cognitive	C.P. (10%) End Term (40)	5	7