WASHINGTON STATE UNIVERSITY
VANCOUVER
World Class. Face to Face.

School of Engineering and Computer Science

ECE 411: Energy Systems
Master Syllabus

Catalog Data:	**ECE 411: Energy Systems**; 3 credits (2-3) Investigation and analysis of the design, tradeoffs and efficiency of conventional and alternative energy sources; energy transmission, storage and conversion systems. Typically offered in Fall.
Class Schedule:	Two lecture hours per week, for one semester.
Laboratory Schedule:	One 3-hour lab session, for one semester.
Prerequisites by Course:	ECE 321
Prerequisites by Topic:	Understanding of circuit theory, modeling and analysis
Typical Text:	*Electric Energy: An Introduction, 3rd Edition*, M. A. El-Sharkawi, CRC Press 2013
Course Coordinator:	Dr. Josue Campos do Prado
Course Objectives:	Students will: 1. Gain in-depth knowledge of the concepts governing energy flows, heat transfer and energy conversion. 2. Gain practical skills of techniques and technologies required to achieve cost-effective generation and conservation of energy and the reduction of environmental pollution. 3. Understand the issues involved in the management of energy in industry. 4. Design of energy-efficient systems and processes. 5. Perform analyses of the performance and rudimentary design of various energy conversion systems. 6. Perform comparative analysis of various energy conversion systems. The comparisons will include cost, social acceptability as well as environmental consequences.
Topics Covered:	1. History of power systems 2. Power transmission and distribution lines 3. Power plants: hydroelectric, fossil fuel and nuclear 4. Renewable energy: solar, wind, geothermal and biomass 5. Photovoltaic cells 6. Power plant environmental impacts 7. Power plant economics 8. Three-phase AC circuits 9. Power electronics 10. Transformers 11. Electric machines: motors and generators 12. Power distribution and blackouts
Lab Experiments and Activities:	Laboratory sessions will cover power conversion, power electronics, photovoltaic power generation, wind power generation, motors, generators and transformers.
Course Outcomes:	Students will be able to:

	Assessed for	1-c. Use appropriate models to formulate power transmission lines, transformers, induction motors and synchronous generators. 6-c. Conduct analysis and interpretation of the data in energy systems. 6-d. Draw conclusions by evaluating experimental results with respect to engineering knowledge gained in energy system lectures.		
	Other	1-d. Apply scientific and/or engineering principles toward solving energy system problems. 2-c. Apply realistic constraints such as public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors in the design process of energy systems such as power transmission lines and power plants. 5-a. Establish goals, tasks, timeline, etc. as a team in energy systems lab. 5-b. Share responsibilities and information on lab reports and homework schedule and tasks with other members of the team. 5-c. Collaborate with individuals with diverse backgrounds, skills and perspectives in the lab. 6-b. Use appropriate equipment and techniques for experimentation, such as oscilloscopes, DMMs, and power panels. 7-c. Apply new knowledge in solving engineering problems in power systems.		
Relationship of Course to Program:		Meets: Educational Objectives 1, 2, 3, 4 Student Outcomes 1, 2, 5, 6, 7		
Prepared by:			Date:	Revised 1-7 - 3/27/2018; reviewed 8/31/21 A-K: Dec. 31, 2009, reviewed 10/2011; Reviewed 02/12