WASHINGTON STATE UNIVERSITY
VANCOUVER
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School of Engineering and Computer Science

ECE 421: Introduction to Solar Cells
Master Syllabus

Catalog Data:	**ECE 421 Introduction to Solar Cells**: 3 credits (2-3) Materials, structures and devices used in renewable energy systems with the focus on solar cells. Typically offered in Fall.
Class Schedule:	Two 50-minute lectures per week, for one semester
Laboratory Schedule:	One three-hour lab session per week
Prerequisites by Course:	Physics 202
Prerequisites by Topic:	1. Electricity 2. DC and AC circuits
Required Texts:	*Solar Photovoltaics: Fundamentals, Technologies and Applications*, 3rd Edition, Chetan Singh Solanki, ISBN: 9788120351110
Course Coordinator:	Dr. Praveen Sekhar
Course Objectives:	1. Understand the principles and mechanisms of renewable energy technologies. 2. Be familiar with the concepts in renewable energy systems such as the photovoltaic effect. 3. Understand the principle behind the operation of solar cells. 4. Demonstrate the knowledge of the design and fabrication of solar cells. 5. Gain hands-on experience in laboratory involving different electrical circuits powered by solar cells. 6. Apply the knowledge of solar cells in the design and implementation of a solar powered car.
Topics Covered:	1. World Energy Scenario (1 week) 2. Fundamentals of Semiconductors (3 weeks) 3. P-N Junction Diode (2 weeks) 4. Design of Solar cells (4 weeks) 5. Thin Film Solar Cell Technologies (2 week) 6. Emerging Solar Cell Technologies and Concepts (2 weeks) 7. Organic Solar Cells (2 weeks)
Lab Experiments and Activities:	1. Measure the resistivity of semiconductors using the four-point probe method. 2. Estimate solar radiation intensity using a solar simulator and a solar power meter. 3. Build solar cell circuits to power electronic devices. 4. Characterize four types of solar cells and calculate the fill factor and efficiency. 5. Design and test a dye-sensitized solar cell.

Course Outcomes:	Students will be able to:			
	Assessed for Student Outcomes	3-a. Produce lab reports, using appropriate formats and grammar using discipline specific conventions including citations. 4.a. Evaluate solar energy solutions considering the global, economic, environmental and societal impacts. 5-a. Establish goals, tasks, and timeline to build the solar car. 5-b. Share responsibilities and information on project schedule and tasks with other members of the team. 5-c. Collaborate with electrical engineering, mechanical engineering, and computer science students. 6-b. Use appropriate equipment and techniques to characterize solar cells.		
	Other	1-a. Demonstrate the fundamental knowledge of semiconductors in designing solar cells. 2-c. Apply the design process to satisfy the cost and weight requirements of the solar car. 3-b. Deliver well-organized oral presentations describing the design and implementation of the solar car.		
Relationship of Course to Program:	Meets: Educational Objectives 1, 2, 3, 4 Student Outcomes 1, 2, 3, 5, 6			
Prepared by:	Praveen Sekhar		Date:	March 12, 2018; 3/21/18 (mb) 8/31/21 (mb)