



Prof. Dr. Ahmed Ennaoui

Currently, president of the scientific council of IRESEN. Founded the Virtual-Learning University. Conducted research for his habilitation at the Hahn-Meitner-Institute-berlin (1983-1987), Germany. Appointed head of research group Helmholtz-Zentrum Berlin (HZB) for materials and energy (2000). Served as Research Director at Qatar Environmental and Energy Research Institute (QEERI) and Joint Professor at Hamad Bin Khalifa University (HBKU), Served as visiting professor at the Research Center for Solar Energy Chemistry, Osaka university and taught research-seminars on Advanced Thin Film chalcogenide solar cells. Expertise on thin film R&D and nanostructured solar cells, PV soiling solution, and O&M of the infrastructure at the STF, low CAPEX manufacturing of thin Film PV technology. Alumni Network Freie Universität Berlin –Editorial Board/ Elsevier for the journal Solar energy materials and solar cells

Syllabus	Solar Photovoltaics Technology and Balance of System (BoS)
<p>Courses description Course objective Topics covered and Out of Class Assignments</p> 	<p>This course is designed to provide students with a combination of theory and application skills in current and emerging photovoltaic technologies. The first session starts with an introductory tutorial on photovoltaics portfolio, then the main courses will cover all aspect of solar energy conversion namely, solar energy insolation, and computing the optimal tilt angle of a solar panel. The solar cell physics and the fundamentals of photovoltaic and (photo)-electrochemical solar energy conversion will be developed. It will focus on wafer silicon photovoltaic technology versus thin film emerging technology and the basic manufacturing processes for the production of solar panels and monolithic integration. Particular interest will be given to manufacturing cost and resource limitations to terawatt photovoltaic and earth-abundant-materials for PV technology. We will explore the advanced approaches for improving photovoltaic performance with a survey on III-V devices, high concentration CPV, multijunction structures, organic/inorganic photovoltaic. The course will be completed with cell and module measurements, and how solar cells are connected to form modules and arrays for various applications such as stand alone, grid connected, building integration photovoltaic (BIPV) and balance-of-system mean? BOS components</p>
Delivery & Duration	Online Classes starting November 2021 / 1H / Week / Some discussion tutorials are planned
Who this programme is for	/ Enginnering schools / Bachelor / Master/PhD 1 meeting per week, 1 hour each
Certificate of Completion	Upon completion of a course, and once the participation has been verified, the candidate will receive an electronic certificate to download, print, and keep in his records Signed by the VLU/Prof. Ahmed Ennaoui
Topics Covered	<p>Part I - Solar radiation basis and Solar resource Part II - Physic of solar cell and Silicon wafer PV technology Part III - Silicon wafer manufacturing Technology Part VI - Thin film PV emerging technology Part V - Advanced solar cell design and next generation of PV technology Part VI - Cell performance measurements Part VII - Cell performance analysis Part VIII - Solar PhotoVoltaic System Design and BOS Part IX - PV Measurement and Reliability Part X - PV market and economy Part XI - Project Work presentations</p>
Media Tools & methods	<p>Virtual courses / Zoom powered by Sabaek for Education & Training (Bahrain) Use of effective use of video as an educational tool Student engagement by making video part of homework assignment</p>
Textbook(s) and other reading materials	<p>PREQUIREQUISITE (S): Basic elements of quantum mechanics and statistical physics Basic element of solid-state physics and material sciences</p> <p>Required Text(s): Solar Cells: Operating Principles, Technology and system Applications, Martin A. Green, Published by the University of New South Wales, 1998, ISBN 0 85823 580 3 / Third Generation Photovoltaics; Advanced Solar Energy Conversion, Springer-Verlag Berlin Heidelberg 2003 Materials Concepts for Solar Cells, Imperial College Presss, 2014, Thomas Dittrich Material from Internet State-of-the-art textbooks with advanced media items (audio, video fragments, animations and dynamic figures) by Ahmed Ennaoui (in preparation)</p>
Application Deadline	Send an e-mail to info@vluplatform.net to receive zoom invitation