جامعة التعلم الافتراضي
VIRTUAL LEARNING UNIVERSITY

Dr Saleh Khamlich

Senior researcher at the University of South Africa, expert in solar thermal systems, nanofluids and nanotechnology for the exploitation of renewable energy sources, graduted from Tshwane University of Tachnology. founded the Nanoenergy for Sustainable Development in Africa (NESDAF) initiative, which is a program focused on promoting the sustainability of renewable energy ecosystems to ensure socio-economic development in Africa /

Syllabus	**Solar Thermal Systems**
Courses description ***Weekly Schedule of Course Topics covered and Out of Class Assignments***	*This elective subject covers details of the fundamentals and thermal applications of solar energy. This includes Solar radiations, functional nanomaterials and thin films for solar thermal energy applications, solar heating/cooling and drying applications are studied. Additionally, thermal storage of solar energy is addressed. The overall aim of the course is to prepare the student for intensive research and development of various solar thermal systems. This will be done through equipping the students with know how of latest practical developments and analytical methods in solar heating, cooling, mass transfer and thermal storage, and leading them to identify existing gaps on the African continent*
Delivery & Duration	Online Classes |# Months : # hrs/Week
Who this programme is for	Graduate students | Bachelor/Master/PhD |
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/**Dr Saleh Khamlich**
Topics Covered	•Basics of Solar Thermal Engineering •Terrestrial solar radiation, Collection and Heat Transfer •Theory of Flat Plate Collectors, Geometries; Design variables, Energy balance, Flow rates and Efficiencies •Theory of Concentrated Solar Power systems, Geometries; Optical performances, ray tracing and efficiencies; Paraboloidal and central receiver systems •Thermal energy storage, Water; Packed beds, storage walls; Phase Change Materials and chemicals •Design of solar thermal power plants, configurations, selective solar absorbers, working heat transfer fluids (i.e., nanofluids) and thermal efficiencies •Nanotechnology in the Service of Solar Thermal Energy Systems
Solar radiation basis and Solar resource are **delivered in the Syllabus PV Technology (BOS) / See Prof. Ahmed Ennaoui's Syllabus Description**	***Solar radiation basis and Solar resource****: Compare Solar spectrum to black body radiation, understand how much energy does the sun deliver and the solar Radiation at The Earth's Surface, learn how to measure the Photon Flux, how many photons at each energy come from the sun. Estimate solar radiation on horizontal and tilted Surfaces, Global Solar radiation data, Understand all about Solar Test Facilities (e.g. IRESEN) and which solar PV technologies are best suited for harsh climate (e.g. Moroccan's climate)*
Media Tools	Virtual courses / Zoom management by Sabaek for Education & Training (Bahrain)
Textbook(s) and other reading materials	**Prescribed Textbooks** J. A. Duffie, W A Beckman (2020). Solar Engineering of Thermal Processes, 5th Ed. Wiley G.N. Tiwari (2013). Solar Energy: Fundamentals, Design, Modelling and Applications, Alpha Sc. Int. Ltd **Recommended Reading:** *S.A. Kalogirou (2014). Solar Energy Engineering Processes and Systems, 2nd Ed. Elsevier.* *Soga, T. ed., (2006). Nanostructured materials for solar energy conversion. Elsevier.*
Application Deadline	*Send an e-mail to info@vluplatform.net to receive zoom invitation*