



جامعة التعلم الافتراضي
VIRTUAL LEARNING UNIVERSITY

Eng. Youssef DAAFI eologist Expert : CPG-AIPG, EurGeol-EFG, QP-MMSA & RM-SME

Manager of "Accelerated Mining Technology Transfer Platform for Africa" at TTO, UM6P, he is Geologist Engineer graduated from "Ecole Nationale Supérieur des Mines de Rabat", Bachelor, Cadi Ayyad University in « Metallogeny, Certificate Colorado School of Mines in "Phosphate Mining", MSc at HEC-Paris in «Geopolitics and Geoeconomics of emerging Africa». Long standing interest and diverse technical expertise in mining sector. Visited and worked in several countries. Lecturer, highly engaged in Geological Sciences at UM6P (EMINES, ESAFE...). Recognized by several international and national organizations: CPG (Certified professional Geologist) at AIPG (American Institute of professional Geologists), EurGeol (European Geologist) at EFG (European Federation of Geologists), RM (Registered Member) at SME (Society for Mining, Metallurgy and Exploration), QP (Qualified Person) in Geology and ore reserves at MMSA (Mining and Metallurgical Society of America), Regular Member at EGU (European Geosciences Union), Licensed Person by Moroccan Ministry of Energy, Mines and Environment and PEV (Program Evaluator) at ABET (Accreditation Board of Engineering and Technology).

Syllabus

Courses description

Weekly Schedule of Course Topics covered and Out of Class Assignments



Strategic Raw Minerals for Renewable Energy

The shift to low-carbon energy systems will imply massive changes in the raw materials requirements, due to the deployment of the technologies. For example, Rare Earth Elements such as neodymium, dysprosium and praseodymium, are key ingredients of permanent magnets used in high-performance wind turbines. Borates, gallium, germanium, indium and silicon metal are needed in solar photovoltaic, robotics and digital technologies. Batteries employ some materials such as cobalt and natural graphite, which are also required in 3D Printing and digital technologies. Platinum is used as a catalyst in Fuel Cells and in digital applications, for example for hard disk drives. Overall, the renewable sector requires many raw materials ranging from very high to low supply risk. The course will focus on the importance of these materials in the technological development of renewable energy, its resources and reserves, production, demand and supply.

The main objective of this course is to provide an overview of critical materials used in technology development in the renewable energy sector. The attendees will have a fundamental understanding of :

- Mine life cycle
- Main critical materials
- Market analysis
- Prices and price volatility
- Supply from primary materials
- Supply from secondary materials/recycling

Program Learning Outcomes (PLOs)

- Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use scientific judgment to draw conclusions.
- Ability to acquire and apply new knowledge as needed, using appropriate learning strategies
- Ability to understand the impact of strategic raw materials in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

Pre-requisites

Renewable energies : Fundamentals; Crystal Structure; Electrochemistry – General Chemistry, Geosciences : fundamentals geology and mining

Textbook(s) and other reading materials

- Energy Storage: Fundamentals, Materials and Applications, Huggins Robert (2016) DOI 10.1007/978-3-319-21239-5
- Energy Storage Systems, David Elliott (2018), DOI <https://doi.org/10.1088/978-0-7503-1531-9>
- Advanced Battery Materials, Chunwen Sun (2019), DOI:10.1002/9781119407713
- Reviews & Publications (Scopus & Web Of Science)
- Available reading materials on the internet

Delivery & Duration

Who this programme is for

Online Classes | Bachelor/Master-Ing./PhD | unit per week, 1h30 each
Graduate students (Bachelor, Master, Ing. , PhD)

Course 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. Youssef DAAFI**

Media Tools

Virtual courses / Zoom management by Sabaek for Education & Training (Bahrain)

Contents & Chapters

Lecture Units :

Mining Basics, Supply chains of the technologies used in the renewable energy sector,
Antimony , Baryte , Aluminium and Bauxite , Beryllium , Bismuth, Borates , Cobalt , Coal , Fluorspar , Gallium , Germanium , Hafnium , Indium , Lithium , Magnesium, Natural Graphite , Niobium , Platinum-Group Metals , Phosphate rock and Elemental Phosphorus
Rare Earth Elements (REE) , Scandium , Silicon metal , Strontium , Tantalum , Titanium , Tungsten , Vanadium

Application Deadline

Send an e-mail to info@vlu.com to receive zoom invitation