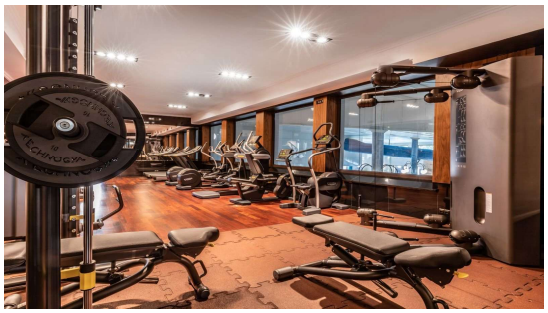
Needs assessments

A/ Equipements

1- Building arrangements and spaces

Arrange the Amphitheater : Armchairs change, sound insulation and sound system, carpet, giant screen, desk and decorative accessories, maintenance of the air conditioning and heating system. 200 000 $	
Media center arrangement of the 2 floors : (180m2*2): (chairs and computers, interactive dashboards, internet connection, giant screen, high-end computers, licenses for applications, library subscriptions, fittings : sound insulation, air conditioning, sound system 250000 $	
MOOC production and virtual communications room **creation** **200 000** $	

- Trading room **creation** **200 000** $	
- Indoor gym and swimming pool for training **creation** **300 000** $	
- Language lab (for active pedagogy, headphones……tables…….) **creation** 250 000 $	
- Area for university and students life (Snack bar, games, leisure area) and safe space for student interaction 150 000 $	
- Arrange the space for future research for health and nutrition for Sustainable projects 200 000 $	
- Security system for ENSTAB	

50 000 $	
- Sanitary blocks and grounds maintenance 100 000 $	
- Reconstruction of school in the interior (Si bouzid ,) (building, PV…),Improve the primary schools conditions 1 000 000 $	

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2- Pedagogic equipments and research (600 000 $)

- E-learning platform, augmented reality,
- Computers and calculators for research
- Tablets for students and teachers
- Solar PV and solar power pilot station controlled by the centralized software for electric power production for ENSTAB
- Equipping a Fablab at ENSTAB
- Strengthen the Clean Energy and Nanotechnologies, Advanced Technologies and Industrial Digitization departments with laboratories for practical work.

Clean Energy Lab: (CEL) (1 000 000 $)

Objective of laboratory

The main objective of establishing Clean Energy Lab (CEL) is to promote the emerging technology of renewable energy i.e. solar energy and its applications

Necessary materials, processes and especially separations which can improve the sustainability of modern energy related advanced technologies :

a) Energy conversion (Hybrid motor ,solar absorption device, Solar Organic Rankine Cycle machine, cooling tour, thermal exchangers);

- **b) Green Energy equipments** (PV units, Solar Concentrators, Pyrolysis, wind power turbine,, fuel cell, electrolyzer
- **c) Biofuels equipment** (biofuels motors, pyrolysis, electrolyzer , The Computer Controlled Biogas Process Unit, catalysis for clean energy production, biofuel production from microalgae and thermodynamic optimisation and energy storage;)
- **d) Energy storage Equipment (hydrogen generator…)**
- **e) Hydrogen equipments** The Computer Controlled PEM Fuel Cell Advanced Unit, "EC6C", The H2 Hybrid Fuel Cell Automotive Trainer; Hydrogen generator for electrical vehicle, Battery Lithium, HUAWEI Three phase solar inverter, PEVER Tracer-AN MPPT Solar Charge Controller, Rectification And Inversion Of Wind energy Power Generation Renewable Energy,
- **f) Energy of buildings** : Temperature, humidity and light sensors that collect environmental data inside and outside buildings.A data acquisition center. Water, electricity and energy meters. - Measurement and analysis equipment: Infrared thermography, Anemometers, Luxmeters, Indoor air quality measuring devices. - Modeling and simulation software and Energy simulation software: TRNSYS, REVIT, ClimaWin, Pleiades, SKETCHUP, AUTOCAD, REVIT

- **g)Software and frameworks:**

Machine learning frameworks (TensorFlow, PyTorch, Scikit-learn): free, open-source

Development environments (Python, Jupyter Notebook): free, open-source

Cooling and power supply:

Cost depends on the chosen cooling solution and redundant power supply.