# **Applied Science and Engineering Summer Program For Skills Development**

# (ASES - Program)

#### **I. Short Description**

The American University of Iraq, Sulaimani (AUIS) is proud to launch the **Applied Science and Engineering Summer Program for Skills Development (ASES Program)** a six-week, hands-on initiative designed to engage talented undergraduate and postgraduate students, along with a limited number of faculty members from universities across the region. The program empowers participants to design and develop working prototypes that address real-world challenges facing Iraq and the Kurdistan Region.

ASES provides an immersive, project-based learning experience where individuals gain practical skills by experimenting, building, and problem-solving. Participants will have full access to AUIS laboratories and facilities to develop solutions in the fields of engineering and applied sciences.

Each summer, participants select from a set of challenge-driven, locally relevant topics. Using AUIS campus resources, they collaborate to create practical, low-cost technological solutions. The program concludes with a project showcase, and participants receive certificates of completion. All completed prototypes will be preserved and displayed as part of AUIS's legacy of applied innovation.

#### **II. Mission Statement**

To cultivate innovation, technical competence, and creative problem-solving among students through self-directed, hands-on projects that tackle real-world challenges—preparing them for future academic and professional pursuits while delivering meaningful contributions to the university and wider community

#### **III.** Objectives

- Promote regional collaboration and innovation among undergraduate and postgraduate students, as well as faculty.
- Support the development of low-cost, locally relevant technological solutions.
- Enhance participants' research, prototyping, and problem-solving skills.
- Develop essential skills required in the Research & Development sector.
- Foster entrepreneurial thinking in young minds.

#### **IV. Program Structure**

- **Duration**: 6 weeks
- Team Composition: 5 participants per project
- **Disciplines**: Engineering, Geology, Physics, Chemistry, Computer Science, and related fields
- Focus Areas: Development of practical solutions to regional issues such as AI technology, water scarcity, energy, pollution, disaster preparedness, and sustainability.

#### Weekly Breakdown

Week Number	Details
Week 1	Orientation, project selection, and initial design planning (submission of project sketch)
Week 2	Prototype development (build phase)
Week 3	Midpoint review and troubleshooting
Week 4	Testing and refinement
Week 5	Final adjustments and poster preparation
Week 6	Project presentations and evaluations

#### V. Facilities & Resources

Throughout the program and in the morning part of the day, a team made of the program director, selected number of faculties and lab assistants will be on site for support and advice.

Participants will have supervised access to AUIS laboratories and equipment, including:

- Physics Labs
- Engineering Labs
- Fabrication Labs
- Circuit & Electronics Lab
- Mechanics Lab
- Computer Labs (for simulations and software development)
- 3D printers, sensors, microcontrollers, and electronic test equipment

#### VI. Selection Criteria for Participants

- 3rd- and 4th-year undergraduate students
- Postgraduate students
- Selected faculty members in relevant fields
- Full-time commitment for 6 weeks (Monday to Thursday, 09:00–14:00)

#### VII. Deliverables

- A functional prototype
- A final presentation and demonstration
- A project poster
- All prototypes and related materials will remain at AUIS as part of its educational and innovation archive

#### VIII. Expected Impact

- Short-Term: Build students' capacity to develop real-world solutions to regional problems
- Long-Term: Foster collaboration between AUIS and regional institutions, and enable development of scalable or commercializable innovations

#### IX. Call to Action

We invite faculty members and universities to support ASES by nominating exceptional students and proposing real-world challenges that could be addressed through research and prototyping.

To encourage innovation and guide participants in selecting meaningful and impactful themes, the following proposed projects are encouraged by the ASES Program.

# **Applied Science & Engineering Summer Program**

#### **For Skills Development**

# **Proposed Student Projects**

## 1. Solar-Powered Autonomous Electric Road Cleaning Vehicle

#### **Objective:**

To design and build an autonomous road-cleaning vehicle powered by solar energy. The vehicle should detect and avoid obstacles in real-time using AI-based navigation systems. **Fields:** Engineering, Computer Science, Artificial Intelligence (AI), Physics

# 2. Solar-Powered Autonomous Reservoir Cleaning Boat Objective:

To design and build an autonomous, solar-powered boat for cleaning reservoirs. The boat should navigate independently and avoid obstacles using smart sensors and AI-based systems. **Fields:** Engineering, Computer Science, Artificial Intelligence (AI), Physics

## 3. Automatic Irrigation System for the Farming Industry

## **Objective:**

To develop a smart irrigation system capable of remote monitoring and control. The system should optimize water usage through sensor-based automation to minimize waste and ensure efficient irrigation.

Fields: Engineering, Computer Science, Artificial Intelligence (AI), Physics

## 4. Low-Cost Earthquake Early Warning Sensor

## **Objective:**

To design an affordable seismic sensor system capable of detecting low-level ground vibrations and issuing early warnings to local authorities in the event of increased seismic activity.

Fields: Engineering, Geology, Geophysics, Computer Science, Artificial Intelligence (AI), Physics

# 5. Air Quality Monitoring Tower for Industrial Zones Objective:

To construct a sensor-based monitoring system for measuring and reporting air quality in real-time. The system will be deployed in industrial zones to support environmental oversight and public health policy decisions.

Fields: Engineering, Computer Science, Artificial Intelligence (AI), Physics

#### 6. Gravitational Battery for Solar Energy Storage

#### **Objective:**

To develop a gravity-based mechanical battery that stores excess solar energy during the day by lifting a heavy mass. The stored potential energy will be converted back into electricity at night or during low-sunlight periods.

Fields: Engineering, Physics

#### 8. Creation of a Laboratory Wind Tunnel

#### **Objective:**

To design and construct a small-scale wind tunnel for academic and research use. The system should include sensors to measure airflow parameters and support experiments in aerodynamics and turbine design.

Fields: Engineering, Physics, Computer Science

## 9. Maleek Mahmood Autonomous Tram System

#### **Objective:**

To design and construct a small-scale autonomous tram system operating along Maleek Mahmood Ring Road in Sulaimani. The tram should operate at ground level and include an emergency stopping system to respond to accidents or technical failures. The project aims to demonstrate the feasibility of smart, eco-friendly public transportation for future urban development.

Fields: Engineering, Physics, Computer Science

## 10. Dynamic Traffic Light Control System Using Real-Time Data

## **Objective:**

This project proposes a system that adjusts traffic signal timings based on real-time vehicle density detected through sensors or cameras. By analyzing traffic patterns dynamically, the system reduces congestion and improves overall flow efficiency. It includes built-in emergency overrides and failsafe mechanisms to ensure reliability under all conditions. The outcome will be a responsive, adaptive traffic control prototype suitable for modern transportation networks.

#### Fields:

Engineering, Computer Science, Artificial Intelligence, Physics

#### 11. Smart Soil Analysis System Objective:

To design a smart soil monitoring device using sensors to measure parameters such as moisture content, temperature, pH, salinity, and compaction. The system will provide continuous diagnostics to support informed agricultural decisions. It promotes efficient irrigation, optimal nutrient management, and soil health monitoring.

Fields: Physics, Geotechnical Engineering, Agriculture, Robotics, Programming

## 12. Public Park (or car park) Energy Harvesting Pathways

## **Objective:**

Prototype a pedestrian pathway (or car park) that generates electricity from foot (or car) traffic (piezoelectric effect) to power lights or charge public devices in Sulaymaniyah Public parks (or car park).

Fields: Physics, Electrical Engineering, Materials Science.

## 13. Pedestrian Safety Alert System for Crosswalks

## **Objective:**

Create a smart crosswalk system that uses motion sensors and LED lighting to alert drivers when pedestrians are crossing, reducing accidents in busy intersections.

Fields: Electrical Engineering, Civil Engineering, Physics.

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