

## I. INTRODUCTION

### 1.1. Brief History of National Ilan University

National Ilan University (NIU) is the only national university in Yilan County, strategically located in the heart of Yilan City. It has a long history as one of Taiwan's oldest higher education institutions, dating back to 1926 when it started as a five-year junior college known as the Taiwan Provincial Ilan School of Agriculture and Forestry. Due to the dynamic economic growth and profound industrialization experienced in Taiwan, a significant transformation occurred in 1992, leading to the elevation of the institution's status, and was restructured as the distinguished National Ilan Institute of Technology, positioning itself as a prominent polytechnic college in the region. Now it is known as National Ilan University. The university has its forest land in Jiaoxi that is dedicated to experimental use, forestation, and ecological research. NIU currently has four colleges: the College of Humanities and Management, the College of Engineering, the College of Bioresources, and the College of Electrical Engineering and Computer Science, as well as 15 departments and 17 graduate programs (Appx 1). NIU also has a specialized campus in Wujie that specializes in professional animal research, as well as another at Yilan Scientific Park. The student population at NIU has reached impressive numbers, with 4,400 undergraduate students and 480 postgraduate students currently enrolled. These students have the opportunity to learn from a distinguished faculty comprising over 235 teaching staff. The university also takes pride in its extensive network of nearly 40,000 alumni, who have made significant contributions in various fields.

### 1.2. Main Activities in National Ilan University

#### a. Research:

National Ilan University is well-known for its research, particularly in agriculture, life sciences, environmental studies, and information technology. Many research centers and institutes, such as the Center for Biotechnology, the Center for Agro-ecology, and the Center for Water Resources, have been created at the university to conduct study in fields such as biotechnology, sustainable agriculture, climate change, and big data analytics. NIU also supports collaboration among researchers, both inside the institution and with other institutions and industry to improve the quality and impact of its research.

b. Teaching and Learning:

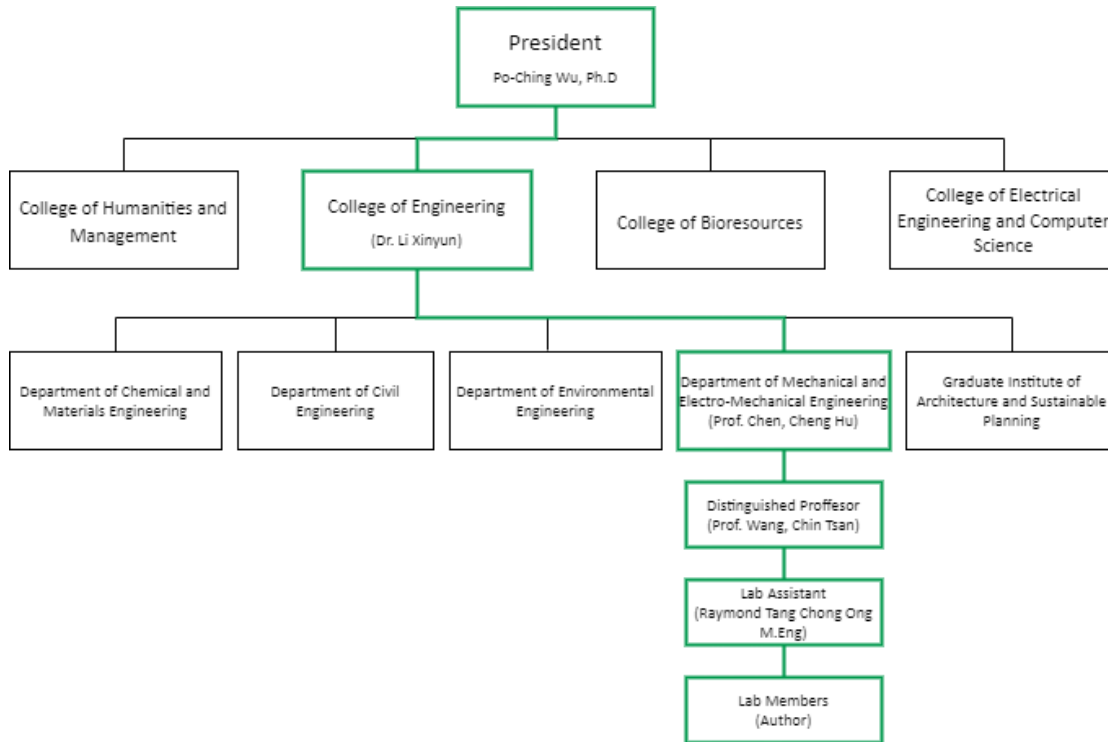
National Ilan University provides undergraduate and graduate degrees in various fields, including agriculture, engineering, social sciences, and humanities. The teachers at NIU are experts in their disciplines, and they are committed to providing students with a dynamic and challenging learning environment. The institution also stresses practical and hands-on learning activities such as internships, field excursions, and research projects to prepare students for future jobs.

c. Internationalization:

National Ilan University is committed to promoting internationalization and global engagement. Over 200 universities and research institutes in more than 40 countries have formed collaborations with the university, allowing for student exchange, research collaboration, and collaborative degree programs. They also open for Taiwan Experience Education Program (TEEP) in their several colleges. NIU also regularly holds several international conferences. These conferences draw people from all around the world, allowing the exchange of knowledge and developing worldwide research collaborations. Furthermore, NIU offers language classes and cultural events to help international students adjust to life in Taiwan and to encourage intercultural understanding among its students and staff members.

### **1.3. Organizational Structure**

National Ilan University is led by Po-Ching Wu, Ph.D. president, and Dr. Li Xinyun, dean of the College of Engineering. In the College of Engineering, there are 5 departments. One of them is the Department of Mechanical and Electro-Mechanical Engineering, managed by Prof. 陳正虎 (Chen, Cheng Hu) as the Head of the Department and an Associate Professor. The author worked in that department in their Thermofluid Bio-Energy Laboratory (TFBE), supervised by a Distinguished Professor 王金燦 (Wang, Chin Tsan), who is also the Director of Taiwan MOST in India, and supervised by Raymond Tang Chong Ong M.Eng., a Ph.D. student working as a laboratory assistant. In the TFBE lab, the author worked with 2 other members.



**Figure 1.** A brief organizational structure of National Ilan University.

#### 1.4. Educational Goals of National Yilan University College of Engineering

Educational Goals:

1. Cultivate engineering talents with a comprehensive outlook.
2. Cultivate engineering talents with humanistic quality, professional ethics, and social responsibility.
3. Cultivate engineering talents with essential personality traits such as initiative and teamwork.

In addition to the above three goals, the College of Engineering, National Yilan University also includes the following educational goals:

1. Cultivate talents with independent thinking and research and development capabilities.
2. Cultivate talents with forward-looking and international vision and continuous self-growth.

The educational objectives of the on-the-job special class of green technology master's degree in the College of Engineering, National Yilan University are as follows:

1. Green technology engineering talents with independent thinking and research and development capabilities.
2. Green technology engineering talents with forward-looking and international exchanges and continuous self-growth.
3. Green technology professional engineering talents with innovative ability

### **1.5. Description of Mechanical and Electro-mechanical Engineering Department**

The department is a forward-thinking department that actively promotes cross-disciplinary teaching and research in green energy, energy conservation, electric vehicles, smart machinery and manufacturing, and AI automation. The department's curriculum is designed to provide students with a comprehensive engineering education, offering three major fields of study:

1. The Smart Machine Design and Manufacturing Credit Program
2. The Thermal and Energy Engineering Credit Program
3. The Electrical and Mechatronics Credit Program

The author was placed in an internship program in the TFBE Laboratory, which is a part of the mechanical and electro-mechanical engineering department. It serves as a dedicated laboratory for research and development in the field of microbial fuel cell design. The laboratory focuses on advancing the understanding and application of microbial fuel cells, which have great potential for sustainable energy generation. Currently, the TFBE Laboratory operates with a team of four personnel, including the author. As of now, there are three different projects being done in the lab, which are dimensional analysis of MFC, MFC in microgravity conditions, and deep-sea sediment MFC in different salinity and temperature. The projects undertaken in the laboratory aim to explore novel approaches, improve the efficiency of microbial fuel cell designs, and contribute to the overall advancement of sustainable energy solutions.