NATIONAL CHUNG CHENG UNIVERSITY

2024 CCU/CoE

INTERNATIONAL INTERNSHIP PROGRAM

COLLEGE OF ENGINEERING (CoE)

國立中正大學
National Chung Cheng University

2024 CCU/COE INTERNATIONAL INTERNSHIP PROGRAM
In Engineering Field

Continuing the yearly internship program in engineering field, the College of Engineering (CoE) offers on-campus research internships for international university students in 2024.

This project-based program provides an opportunity to better understand CCU's research in engineering and technology. Students may practice their skills in the projects, acquire new competence, and experience a different culture.

PROGRAM BENIFITS

To have an enjoyable and enriching experience in academic study and exchange their ideas of research with CCU students.

INTERN PERIOD

March 1 –December 31, 2024

At least 8 weeks. Individual mentors may have a different definition of intern period. For self-supported interns, the period may not be limited as mentioned above. Please refer to each research topic for precise definitions.

FEES

FEE-FREE. The program fee and registration fee will be provided by CoE.

SCHOLARSHIP

Research topics are offered in two types: (A) Scholarship and (B) self-supported. For **type-A**, CCU offers a scholarship covering on-campus accommodation, a weekly stipend (NTD1,500), and airfare reimbursement (maximum NTD10,000). These are standard items and numbers, and the total amount may be amended by the project mentor based on the program budget and the interns' performance.

INTERN RESEARCH TOPICS

Project Number	P1
Project title	Trustable Artificial Intelligence for Critical Applications and 6G Security
Description of the research	Artificial Intelligence (AI) technologies, 6G networking, and quantum computing are the leading forces in bringing the world to the era of better intelligence and full automation. However, the rapid development of such technologies raises concerns that they could be used to damage human life, destroy critical infrastructure, and further violate user privacy. For example, AI power can be exploited to scan the vulnerabilities of critical control systems (SCADA, ITS) or track a target user in a restricted access building, even without physical intrusion. Similarly, the attackers can launch adversarial attacks against AI-based Advanced Driver-Assistance Systems (ADAS) and force connected vehicles to act as unexpected weapons to hit civilians. Early detection of security attacks and secure AI models are the top targets of many current research efforts. In short, our lab is recruiting talents who are interested in the following topics: (1) AI for Cybersecurity: Misbehavior detection in autonomous vehicles, Deep Reinforcement Learning for aerial-assisted networks (UAV-satellite-space) or Intelligent Transportation Systems, Self-supervised Learning, autoDL /ML for Intrusion Detection Systems. (2) Cybersecurity for AI: Trustable AI for automated vehicles and AI-based control systems from adversarial attacks. (3) 6G security: Signal sensing, physical layer authentication, high-accuracy localization and sensing. (4) Space and Quantum security: Blockchain for vehicular/aerial networks; Quantum compatible IDS platforms. For our lab information, please visit: https://ccucyberseclab.github.io
Mentor in CCU	Asst. Prof. Van-Linh Nguyen Dept. of Computer Science and Information Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: nvlinh@cs.ccu.edu.tw)
Expected student level	■ Post-graduate student ■ Third/forth-year undergraduate senior student
Category	■ Scholarship ■ Self-supported
Intern period	At least 8 weeks between Mar. 1 and Sept. 30, 2024

Project Number	P2
Project title	A Study of Grid Forming Inverter-based Resources for Low-Inertia Microgrid
Description of the research	Massive integration of inverter-based renewable energy systems (IBRs) has been displacing conventional synchronous generators and causing a reduction in system inertia. IBRs are integrated into power grids through power-electronics inverters. These are generally categorized as (i) grid-following (GFL) and (ii) grid-forming (GFM) inverters. The GFM inverter is a promising emerging technology that generates its own voltage signal and has the capability to regulate the frequency and voltage at the point of interconnection. The simulation-based research project will focus on investigating the potential applications to enhance low-inertia microgrid resilience and stability when the grid is subjected to severe disturbances.
Mentor in CCU	Prof. Gary Chang, PhD, PE, IEEE Fellow Dept. of Electrical Engineering, National Chung Cheng University, Taiwan, ROC. (e-mail: ieegwc@ccu.edu.tw)
Expected student level	■ Post-graduate student ■ Third/forth-year undergraduate senior student (Higher priority will go to undergraduate students if more than two applicants.)
Category	■ Scholarship (without airfare reimbursement) ■ Self-supported
Intern period	At least 8 weeks between Mar. 1 and Jun. 30, 2024

Project Number	P3
Project title	Computer vision applications based on deep learning techniques
Description of the research	This project is to do researches on computer vision based on the modern deep learning (machine learning) techniques. In this research, you will learn deep learning techniques such as CNN, RNN, LSTM, AE, VAE, etc. The possible applications and topics include: (1) 3D human skeleton extraction, skeleton-based action recognition, action prediction for elderly monitoring, (2) depth estimation from mono-binocular images, (3) 3D object (vehicle, pedestrian, cyclist) detection and positioning from fusion of RGB/LiDAR sensor data, (4) mapless robot navigation based on deep reinforce learning (DRL), (5) object (head/vehicle/human/object) pose estimation from single RGB image, (5) deep learning-based adverse drug reaction (ADR) prediction for clinic medicine use, (6) elderly caring application of AI-generated content (AIGC), such as (text/audio/image) -to-(image/video). The intern student is expected to have some preliminary knowledge on NN (neural network) or deep learning and skilled in Python programming. He/She will learn how to apply state-of-the-art deep learning techniques to solve the indicated problems. For more detail about my topics, please visit my Youtube vide at: https://youtu.be/tIwenpyFRhw
Mentor in CCU	Prof. Wen-Nung Lie Dept. of Electrical Engineering, National Chung Cheng University, Taiwan, ROC (e-mail: ieewnl@ccu.edu.tw)
Expected student level	■ Post-graduate student ■ Third/forth-year undergraduate senior student
Category	■ Scholarship
Intern period	At least 8 weeks (2 months) between Jan. 1 and Dec. 31, 2024. However, 3-6 months is better.

Project Number	P4
Project title	Impulse Radar Imaging System, mmWave/RF Intergrated Circuit design and Energy Harvesting
Description of the research	Four investigation topics over Ultra-Wideband Impulse Radar imaging system: One is back-projection imaging algorithm used to reconstruct the radar image. The second one is the studies of the transmitting and receiving circuits and Vivaldi antenna array. The third topic is mmWave/RF components design such as PA and LNA, by CMOS process or III-V technology. The fourth topic is energy harvesting within wireless communications environment
Mentor in CCU	Assoc. Prof. Janne-Wha Wu Dept. of Electrical Engineering, National Chung Cheng University, Taiwan, ROC. (e-mail: jwwu@ccu.edu.tw)
Expected student level	■ Post-graduate student ■ Third/forth-year undergraduate senior student
Category	■ Scholarship ■ Self-supported
Intern period	At least 12 weeks between Mar. 1 and Dec. 31, 2024

Project Number	P5
Project title	Renewable Energy Integration: Power System Analyses, Power Conversion or Intelligent Control
Description of the research	The students will learn the research topics about renewable energy integration, which includes one of the following issues: ➢ Wind farm modeling and control ➢ Fault diagnosis for solar power systems ➢ Artificial intelligence applications on renewable power systems ➢ Forecasting technologies for renewable power resources ➢ Smart grid control and operation ➢ Energy storage systems ➢ Transmission and distribution system analyses
Mentor in CCU	Prof. Yuan-Kang Wu Dept. of, Electrical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: allenwu@ccu.edu.tw)
Expected student level	■ Post-graduate student ■ Third/forth-year undergraduate senior student
Category	■ Scholarship
Intern period	At least 12 weeks between Jan. 1 and Dec. 31, 2024

Project Number	P6
Project title	Silicon photonics and optical biosesnors
Description of the research	The topic is to develope (a) new types of silicon-based, CMOS compatible photodetectors, which have many advantages over conventional III-V based counterparts for mid-infrared applications, (b) new disposable optical biosensors for cost-effective and rapid biomedical detection for precise medicine. This internship program is open for talents who are interested in advanced optoelectronic-sensing technologies. Focus will be placed on designing, simulating, and analyzing new Si-based group-IV photodetectors and optical biosensors. For related information, please refer to the website of our lab at https://ccuphotonics307.wixsite.com/ccuphotonics307
Mentor in CCU	Prof. Guo-En Chang Dept. of Mechanical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: imegec@ccu.edu.tw)
Expected student level	■ Post-graduate student ■ Third/forth-year undergraduate senior student
Category	■ Scholarship
Intern period	At least 8 weeks (up to 6 months) between Mar. 1 and Dec. 31, 2024

Project Number	P7
Project title	Optical monitoring system for metal additive manufacturing
Description of the research	The goal of this topic is to develop a optical, non-destructive, and real time monitoring system for metal additive system. This internship program is open for talents who are interested in advanced metal additive, precision manufacturing, and sensing technologies. Focus will be placed on designing, simulating, and analyzing new optical monitoring systems for metal additive systems. For related information, please refer to the website of our lab at https://ccuphotonics307.wixsite.com/ccuphotonics307
Mentor in CCU	Prof. Guo-En Chang Dept. of Mechanical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: imegec@ccu.edu.tw)
Expected student level	■ Post-graduate student ■ Third/forth-year undergraduate senior student
Category	■ Scholarship
Intern period	At least 8 weeks (up to 6 months) between Mar. 1 and Dec. 31, 2024

Project Number	P8
Project title	Effect of operating conditions on the performance of an all-vanadium redox flow battery
Description of the research	The performance of the VRFB is influenced by operating conditions, such as electrolyte concentration and electrolyte flow rate. Students will conduct experiments to investigate the effect of operating conditions on the performance of the VRFB and determine a suitable operating strategy.
Mentor in CCU	Prof. Yong-Song Chen Dept. of Mechanical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: imeysc@ccu.edu.tw)
Expected student level	■ Post-graduate student ■ Third/forth-year undergraduate senior student
Category	■ Scholarship
Intern period	At least 8 weeks between Mar. 1 and Dec. 31, 2024

Project Number	P9
Project title	Measurements of densities of liquid-phase reactive species generated by atmospheric pressure plasma jets
Description of the research	Atmospheric-pressure plasma jets have been developed extensively for applications such as plasma medicine and plasma agriculture due to the generation of abundant reactive species being critical for manipulating reaction pathways in different fields. Therefore, it is essential to characterize the densities of reactive species introduced by plasma jets in the liquid phase for various applications. In this project, the densities of $OH/NO_2^-/NO_3^-$ will be explored by using the microplate reader spectrophotometer under different operating conditions to reveal the correlations among reactive species generated in the liquid phase and the discharge parameters. Anyone interested in plasma technology and characterization is welcome to join the project.
Mentor in CCU	Assoc. Prof. Kun-Mo Lin Dept. of, Mechanical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: imekml@ccu.edu.tw; kmlin.tw@gmail.com)
Expected student level	■ Post-graduate student ■ Third/forth-year undergraduate senior student
Category	■ Scholarship ■ Self-supported
Intern period	At least 8 weeks between Mar. 1 and Dec. 10, 2024

Project Number	P10
Project title	Interdisciplinary opto-mechanical integration
Description of the research	Our research is mainly about interdisciplinary integration, such as integration of semiconductor solar photovoltaic components and single-cell biochips, to achieve self-powered biochips, the integration of various micro-nano process technologies such as laser interference lithography, anodized aluminum, nano Imprinting technology on solar cells, light-emitting diode components and the development of novel optical analysis techniques on two-dimensional materials, in the study of cross-domain integration, the study of basic physical mechanisms is very important, such as electronic hole pairs. The relationship between transmission and the polarity of cancer cells, the mechanism of the surface microstructure of the surface for the generation of surface plasma waves, and the interaction between the atomic layer and the atomic layer in two-dimensional materials. Our research is also about the application of hyperspectral imaging on medical images, and the automated optical inspection. These basic mechanisms involve physics, chemistry, materials, optics and other related fields. And there are still many unclear issues on the subject of these studies. If you can further solve these mysteries, you can make a considerable contribution to both basic science and engineering.
Mentor in CCU	Prof. Hsiang-Chen Wang Dept. of Mechanical Engineering, National Chung Cheng University, Taiwan, ROC. (email: hcwang@ccu.edu.tw)
Expected student level	■ Post-graduate student
Category	■ Scholarship ■ Self-supported
Intern period	At least 8 weeks between Mar. 1 and Dec. 31, 2024

Project Number	P11
Project title	Study of lithium ion battery, lithium sulfur battery, metal-air battery, fuel cell and supercapacitor
Description of the research	The research will primarily concentrate on the study of electrocatalysts and nanomaterials with the aim of exploring innovative applications in the realm of energy storage. These applications encompass metal ion batteries, metal-air batteries, fuel cells and supercapacitors.
Mentor in CCU	Prof. Yuan-Yao Li Dept. of Chemical Engineering, National Chung Cheng University, Taiwan, ROC. (e-mail: chmyyl@ccu.edu.tw)
Expected student level	■ Post-graduate student ■ Third/forth-year undergraduate senior student
Category	■ Scholarship ■ Self-supported
Intern period	At least 8 weeks between Mar. 1 and Dec. 31, 2024

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