

NATIONAL CHUNG CHENG UNIVERSITY

2024 CCU/CoE

INTERNATIONAL INTERNSHIP PROGRAM

COLLEGE OF ENGINEERING (CoE)



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

May 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.

PROGRAM ELIGIBILITY

- Graduate school students (master & PhD students)
- University junior students (3rd year or above).
- Those who already complete PhD degree are **NOT** eligible to apply.
- Passport holders of People's Republic of China, Hong Kong, or Macau are **NOT** eligible to apply.
- Current degree-seeking students, exchange, and visiting students in Taiwanese educational institutions are **NOT** eligible to apply.




APPLICATION MATERIALS

1. Online Application Form
2. Curriculum Vitae in PDF format
3. Official Transcripts
4. Letter of Recommendation in PDF format
5. Certificate of language proficiency
6. Research Plan in PDF format
7. Copy of Passport (Bio-page)
8. Head-shot Photo in JPG format (at least 300 KB files ize, 826X1062 pixels.)
9. Other Supplementary Documents(Optional)

APPLICATION

- Applicants should read the requirements of each research topic carefully, complete the online application form, prepare **application materials**, and send them in a ZIP-compressed file to coleng_dia@ccu.edu.tw.
- The title of the e-mail please be marked with “**Application for 2024 CCU/COE International Internship**”. All the intern research topics and their requirements are listed as follows.
- **Application deadline: Mar. 3, 2024**
- More detailed information about application can be found on the website <https://sites.google.com/view/ccu-coe-internship/home>

CONTACT

-  +886-5-2720411 ext. 23003, 23005
-  coleng_dia@ccu.edu.tw
-  No.168, Sec. 1, University Rd., Minhsiung, Chiayi 621301, Taiwan (R.O.C.)



INTERN RESEARCH TOPICS

Number	P1
Project title	Trustable Artificial Intelligence for Critical Applications and 6G Security
Description of the research	<p>Artificial Intelligence (AI) technologies, 6G networking, and quantum computing are the leading forces in bringing the world to an 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:</p> <ul style="list-style-type: none">(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 - safe vehicular/aerial networks; Quantum - compatible IDS platforms. <p>About CISLab: CIS Lab is a leading security research group at National Chung Cheng University, established by Prof. Van-Linh Nguyen. CISLab has been the home of many international students. Students are diverse and come from many countries, e.g., Taiwan, Vietnam, Thailand, Malaysia, Ethiopia, Iran, and India. Our research interests consist of Information Security/Advanced authentication, Cybersecurity in wireless communications, space/drone security, quantum security, and vehicular networks.</p> <p>Lab WEBSITE: https://ccucyberseclab.github.io</p>

Number	P1
Description of the research	<p>What could you get during the internship period?</p> <ol style="list-style-type: none"> 1. The skill to obtain state-of-the-art research on selected topics, e.g., Explainable AI, WiFi sensing 2. Good programming skills through mini projects: e.g., AI models for preventing adversarial attacks 3. Create debate to gain novel or creative ideas to enhance assigned mini-projects 4. Report the results in a professional manner; for example, in LaTeX writing, IEEE Trans format 5. Attend several industry tours, Chinese courses, or research culture introductions. <p>Preferred Intern Education Level</p> <ul style="list-style-type: none"> - Third-year undergraduate students or above - Graduate candidates (had Bachelor/ Master) - Ph.D. students <p>Highly recommend the following candidates to join our lab:</p> <ol style="list-style-type: none"> 1. Strong interest in computer science, computer networks, AI, and cybersecurity. 2. Background knowledge in networking/security, mathematics, optimization, quantum, and computer vision. 3. Publications in my research field 4. International English proficiency certificate (TOEIC >= 550, IELTS >=5.0, TOEFL iBT >= 80)
Mentor at CCU	<p>Asst. Prof. Van-Linh Nguyen Dept. of Computer Science and Information Engineering National Chung Cheng University, Taiwan, ROC. e-mail: nvlinh@ccu.edu.tw</p>
Expected student level	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Scholarship <input checked="" type="checkbox"/> Self-supported
Intern period	8 weeks to 6 months between May and December 2024

Number	P2
Project title	A Study of Grid-Forming and Grid-Following Inverter-based Resources for Low-Inertia Microgrid/Grid with Virtual Inertia and Grid Voltage Support Functions
Description of the research	<p>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. GFM and GFL with virtual inertia and grid voltage support functions are in great demand when the penetration level of IBRs in the grid is high. The simulation-based research project will focus on investigating the potential applications to enhance low-inertia microgrid/grid resilience and stability when the grid is subjected to minor or large disturbances.</p>
Mentor at CCU	<p>Prof. Gary Chang, PhD, PE, IEEE Fellow Dept. of Electrical Engineering, National Chung Cheng University, Taiwan, ROC. (e-mail: ieegwc@ccu.edu.tw)</p>
Expected student level	<ul style="list-style-type: none"> <input type="checkbox"/> Post-graduate student <input type="checkbox"/> Third/forth-year undergraduate senior student
Category	<ul style="list-style-type: none"> <input type="checkbox"/> Scholarship <input type="checkbox"/> Self-supported
Intern period	12 to 20 weeks between April 1 and Dec. 31, 2024

Number	P3
Project title	Lidar and Camera fusion for autonomous driving
Description of the research	<p>This project revolves around the integration of lidar and camera sensor data, aiming to develop robust algorithms for enhanced perception and decision-making in self-driving systems. Interns will engage in the fusion of lidar and camera inputs, leveraging Python and advanced machine learning models. The primary objectives include developing algorithms for sensor data calibration, point cloud processing and image processing to create a comprehensive and accurate representation of the vehicle's surroundings. The primary objective is to develop and optimize algorithms for efficiently processing and interpreting the multi-modality. This includes tasks such as semantic segmentation, feature extraction, and object recognition, all of which are pivotal for the accurate perception of the vehicle's surroundings.</p>
Mentor at CCU	<p>Assoc. Prof. Jui-Chiu Chiang Dept. of Electrical Engineering, National Chung Cheng University, Taiwan, ROC. (E-mail: rachel@ccu.edu.tw)</p>
Expected student level	<p>■ Third/forth-year undergraduate senior student</p>
Category	<p>■ Scholarship ■ Self-supported</p>
Intern period	At least 12 weeks between May 1st and Dec. 31th

Number	P4
Project title	Simulation and Reconstruction of Pencil Beam Scanning of Particle Therapy
Description of the research	<p>Pencil beam scanning in particle therapy is one of the highlight radiation therapies for cancer treatment. Due to the effectively and precisely control for particle-beam, the narrow pulse and extremely high radiation dose rate delivering becomes more and more significant. Basically, the high dose rate will enable the recombination of the ion pair effect, and it can lead to the received signal underestimated. In addition, the higher spatial resolution and wide field of view is necessary. So, the main purpose of the project is to develop a novel algorithm to reconstruct the 2D image of the extremely high dose rate in proton/particle therapies. We hope that the students could join us to implement a novel reconstruction algorithm and try to publish the research work in intern period.</p>
Mentor at CCU	<p>Prof. Chi-Wen, Hsieh Dept. of Electrical Engineering National Chung Cheng University, Taiwan, ROC. (E-mail: chiwenh@ccu.edu.tw)</p>
Expected student level	<input type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input checked="" type="checkbox"/> Scholarship <input checked="" type="checkbox"/> Self-supported
Intern period	At least 8 weeks between May 1 and September 30

Number	P5
Project title	Computer vision applications based on deep learning techniques
Description of the research	<p>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, (2) skeleton-based action recognition/behavior modeling, (3) action prediction for elderly monitoring, (4) 3D object (vehicle, pedestrian, cyclist) detection and positioning from fusion of RGB/LiDAR sensor data, (5) object (head/vehicle/ human/object) pose estimation from single RGB image, (6) deep learning-based adverse drug reaction (ADR) prediction for clinic medicine use, (7) AI-generated content (AIGC), such as (text/audio/image) -to-(image/video), (8) elderly caring application of AIGC, (9) heart rate estimation from facial image sequence. 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/tlwenpyFRhw</p>
Mentor at CCU	<p>Prof. Wen-Nung Lie Dept. of Electrical Engineering, National Chung Cheng University, Taiwan. (e-mail: ieewnl@ccu.edu.tw)</p>
Expected student level	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Scholarship
Intern period	At least 8 weeks (2 months) between May 1, 2024 and June 30, 2025. However, 3-6 months is better.

Number	P6
Project title	Impulse Radar Imaging System, mmWave/RF Intergrated Circuit design and Energy Harvesting
Description of the research	<p>Four investigation topics over Ultra-Wideband Impulse Radar imaging system:</p> <ol style="list-style-type: none"> 1. A back-projection imaging algorithm used to reconstruct the radar image. 2. The studies of the transmitting and receiving circuits and Vivaldi antenna array. 3. mmWave/RF integrated circuit design such as PA and LNA, by CMOS process or III-V technology. <p>Energy harvesting within wireless communications environment</p>
Mentor at CCU	<p>Assoc. Prof. Janne-Wha Wu Dept. of, Electrical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: jwwu@ccu.edu.tw)</p>
Expected student level	<input type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input checked="" type="checkbox"/> Scholarship <input type="checkbox"/> Self-supported
Intern period	At least 10 weeks between May 1 and Dec. 31

Number	P7
Project title	Renewable Energy Integration: Power System Analyses, Power Conversion or Intelligent Control
Description of the research	<p>The students will learn the research topics about renewable energy integration, which includes one of the following issues:</p> <ul style="list-style-type: none"> ➤ 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 at CCU	<p>Prof. Yuan-Kang Wu Dept. of Electrical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: allenwu@ccu.edu.tw)</p>
Expected student level	<input type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input checked="" type="checkbox"/> Scholarship
Intern period	At least 12 weeks between May 1 and December 31, 2024

Number	P8
Project title	Silicon photonics and optical biosensors
Description of the research	<p>The topic is to develop (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</p>
Mentor at CCU	<p>Prof. Guo-En Chang Dept. of Mechanical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: imegec@ccu.edu.tw)</p>
Expected student level	<input checked="" type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input checked="" type="checkbox"/> Scholarship
Intern period	At least 8 weeks (up to 6 months) between May and December

Number	P9
Project title	Optical monitoring system for metal additive manufacturing
Description of the research	<p>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</p>
Mentor at CCU	<p>Prof. Guo-En Chang Dept. of Mechanical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: imegec@ccu.edu.tw)</p>
Expected student level	<input type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input checked="" type="checkbox"/> Scholarship
Intern period	At least 8 weeks (up to 6 months) between May and December 2024

Number	P10
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 at CCU	Prof. Yong-Song Chen Dept. of Mechanical Engineering, National Chung Cheng University, Taiwan, ROC. (e-mail: imeysc@ccu.edu.tw)
Expected student level	<input checked="" type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input checked="" type="checkbox"/> Scholarship
Intern period	At least 8 weeks between May 1 and Dec. 31, 2024

Number	P11
Project title	Measurements of densities of liquid-phase reactive species generated by atmospheric pressure plasma jets
Description of the research	<p>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 $\text{OH}/\text{NO}_2^-/\text{NO}_3^-$ 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.</p>
Mentor at CCU	<p>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)</p>
Expected student level	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Scholarship <input checked="" type="checkbox"/> Self-supported
Intern period	At least 8 weeks between May and December 2024

Number	P12
Project title	Numerical modeling and Experiments of an atmospheric pressure plasma jet operated in air with shielding gas
Description of the research	<p>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. However, it is still challenging to develop a proper plasma source with controlled parameters by experimental measurements because of fast discharge dynamics and complex plasma chemistry. Alternatively, numerical simulations can be used to capture discharge dynamics with detailed chemistry revealed. In this project, a two-dimensional axisymmetric plasma fluid model will be integrated with a two-dimensional axisymmetric gas flow model to predict the dynamic behavior of a helium atmospheric pressure plasma jet. The simulated results will be compared with photos taken by an intensified CCD camera to validate the model. It is a topic involving thermofluid science, which is suitable for students in mechanical engineering.</p>
Mentor at CCU	<p>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)</p>
Expected student level	<input checked="" type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input checked="" type="checkbox"/> Scholarship <input checked="" type="checkbox"/> Self-supported
Intern period	At least 8 weeks between May and December 2024

Number	P13
Project title	Application of Novel Snap-shot based hyperspectral imaging combined with AI to detect Lesions
Description of the research	The early detection of esophageal cancer presents a considerable difficulty, which contributes to its high prevalence as a major cause of cancer-related fatalities. This project will utilize various machine learning models, including YOLOv5, YOLOv8, R-CNN, and Faster R-CNN, to predict and detect early-stage esophageal cancer. It will make use of two models of esophageal cancer images: the white-light images (WLI) model and the hyperspectral narrowband images (HSI-NBI) model. These models will be generated through a conversion algorithm referred to as the spectrum-aided vision enhancer (SAVE). The main goal will be to discover Dysplasia and Squamous Cell Carcinoma (SCC). The evaluation of model performance will be conducted using the created confusion matrix and five important indicators: precision, recall, F1-score, mAP, and the confusion matrix of the trained model.
Mentor at CCU	Prof. Hsiang-Chen Wang Dept. of Mechanical Engineering, National Chung Cheng University, Taiwan, ROC. (e-mail: hcwang@ccu.edu.tw)
Expected student level	<input type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input checked="" type="checkbox"/> Scholarship
Intern period	At least 12 weeks between May and December 2024

Number	P14
Project title	Stirling engines and their applications
Description of the research	<p>The students will learn the research topics about Stirling engines and their applications in renewable energy, which includes one of the following issues:</p> <ol style="list-style-type: none"> 1. Development of a double-acting Stirling engine 2. Development of a kW-class Stirling generation system 3. Development of Stirling heat pumps. 4. Development of a concentrating solar power system. 5. Development of a Stirling waste heat recovery system.
Mentor at CCU	<p>Assoc. Prof. Hang-Suin Yang Dept. of Mechanical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: imehsyang@ccu.edu.tw)</p>
Expected student level	<input type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input checked="" type="checkbox"/> Scholarship <input type="checkbox"/> Self-supported
Intern period	At least 12 weeks between May 1 and December 31, 2024

Number	P15
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 at CCU	Prof. Yuan-Yao Li Dept. of Chemical Engineering National Chung Cheng University, Taiwan, ROC. (e-mail: chmyyl@ccu.edu.tw)
Expected student level	<input checked="" type="checkbox"/> Post-graduate student <input checked="" type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input checked="" type="checkbox"/> Scholarship <input checked="" type="checkbox"/> Self-supported
Intern period	At least 8 weeks between 2024/5/1- 2024/12/31

Number	P16
Project title	Next generation Wireless communication, B5G/6G, Reconfigurable Intelligent Surface, System level simulation, Artificial Intelligence-enhanced wireless research
Description of the research	<p>Innovate and design cutting-edge concepts and architectures beyond 5G (B5G) and 6G.</p> <p>Identify and validate solutions to key problems through simulation or prototype experiments.</p> <p>Conduct research on AI and machine learning techniques applied to wireless communications and networks.</p> <p>Design and implement novel algorithms, models, and protocols to optimize wireless network performance.</p> <p>Collaborate with the research team to manage projects and ensure timely deliverables,</p> <p>Please refer to the website of our lab at https://sites.google.com/view/ccuantlab/english</p>
Mentor at CCU	<p>Assoc. Prof. Jen-Yi Pan</p> <p>Dept. of Communications Engineering,</p> <p>National Chung Cheng University, Taiwan, ROC.</p> <p>(e-mail: jypan@ccu.edu.tw)</p>
Expected student level	<input type="checkbox"/> Post-graduate student <input type="checkbox"/> Third/forth-year undergraduate senior student
Category	<input type="checkbox"/> Scholarship <input type="checkbox"/> Self-supported
Intern period	At least 8 weeks between May 1 and December 31, 2024