Batch 2

WIE 台灣 TAIWAN PROGRAMME

2020 WIE

Taiwan WIE Programme

Centre for Reliability Sciences and Technologies, Chang Gung University
長庚大學

Requirement:
Local **degree and postgraduate** students in the following disciplines and related studies:
Electronic Engineering (for IC design and fabrication), Mechanical Engineering, Computer Science, Industrial and Systems Engineering Applied Physics, Chemical Technology, Statistics
Must be in their penultimate year of study in 2020

No. of Post: Three

Period (tentative):
From 1 June to 31 August 2020 (3 months)

Eligibility:
- Full-time local **degree and postgraduate** students who have yet to fulfill their WIE requirement
- With valid travel document
- Good in Mandarin and written Chinese and English

Stories shared by the PolyU interns last summer: https://polyu.hk/bjGje

APPLY NOW

https://www2.polyu.edu.hk/caps/WIE2020/Taiwan/
Deadline extended: 28 January 2020

The Hong Kong Polytechnic University 香港理工大學

Centre STARS

CAPS Office of Careers and Placement Services

Taiwan WIE Programme

Summer internship positions offered by

Centre for Reliability Sciences and Technologies, Chang Gung University (長庚大學)
(3 Posts)

Target: Local **degree and postgraduate** students in the following disciplines and related studies:

- Electronic Engineering (for IC design and fabrication), Mechanical Engineering, Computer Science, Industrial and Systems Engineering
- Applied Physics, Chemical Technology, Statistics
- Must be in their penultimate year of study in 2020
- With programming knowledge including R, Python is a plus (pls indicate in your resume)
- With pro-active and learning mindset

Duties:

- To support projects on the applications of scientific and mathematical knowledge to enhance the reliability of engineering products and systems at a cost-effective way
- Works could be on electronic products such as IC and PCB, engineering materials including semiconductor materials, metals etc, energy products such as Li Ion Battery, engineering system such as aircraft, oil and gas plant, medical engineering system, as well as communication system
- Projects are highly practical and some are joint effort with academia and commercial sector including Motorola, LiteOn
- Please refer to the project list here (partial list of projects) for details

Period (tentative): From 1 June to 31 August 2020 (3 months)

The application deadline extended to: **28 January 2020**.

For job details and application, please visit: https://polyu.hk/kcEyF

Stories shared by the PolyU interns last summer: https://polyu.hk/bjGje

For enquiry, please contact Office of Careers and Placement Services (CAPS) via wie.caps@polyu.edu.hk.

Project available for exchange students

(Project type: UROP = undergraduate research opportunity projects; UPIP=undergraduate Professional Industrial project (in working with company in Taiwan)

1.

Details	**Description**
Project type	UROP
Title of the project	Development of Brain Oximeter
Abstract of the project	In this work, we will develop a pulse oximeter, which is based on the noninvasive technique to monitor arterial hemoglobin oxygen saturation (SpO_2). SpO_2 level decreases significantly at the blood clotting site in the blood vessel during the brain stroke and hence can be used as a vital indicator to detect the blood clotted sites for immediate treatment. Brain stroke cases are on the rise, as only in the UK more than 1 million people are suffering from the effect of strokes. It is the largest cause of disability in the UK as well as the third most cause of death (after heart disease and cancer). Each year around 120,000 people in the UK have a first stroke and about 30,000 have a recurrent stroke. In stroke care, the term "golden hour" is used to designate the hour immediately following the onset of stroke symptoms. The reason it's "golden" is that stroke patients have a much greater chance of surviving and avoiding long-term brain damage if they arrive at the hospital and receive treatment within that first hour. During this hour different tests are performed such as brain scan (CT scan or MRI scan), blood tests, heart tracing, etc. However, these processes are time-consuming and very expensive. Henceforth, with the proposed pulse oximeter we will make the diagnosis process fast and less expensive. This project is a continuation of our recently developed oximeter for our bodies.
Expected deliveries	A prototype of the oximeter that can measure brain oxygen content
Name of Supervisor	Prof Tan Cher Ming
Department	Center for Reliability Science and Technology

2.

Details	Description
Project type	UPIP
Title of the project	Electromagnetic Strength Measurement
Abstract of the project	Near-field (NF) measurement is the basic for the detection of electromagnetic interference (EMI) at IC level. ICs are often the primary source of radiated emissions, and near field magnetic field can help engineers to track down EMI culprit and solve the problems with a robust IC design. In fact, near field (NF) scanning should be in the region from 10-40 µm for IC. However, below 100 µm, the equipment required to perform NF measurement is not available and beyond 40 µm, the precision to find the source of EMI is low. In practical measurement, the probe distance is usually set at 200 µm to prevent the damage to the probe during scanning. We have developed a scanning magnetic probe based on Magnetic Force Microscopy (MFM), which is an extension of the atomic force microscopy (AFM), in the form of magnetization patterns with sub-micron resolution. The magnetic forces results from the interaction between the magnetic dipoles located on the tip and on the sample. MFM imaging is achieved using special MFM probes. Our Nanonics MV-4000/2000 scanning probe microscope provides the MFM mode, and the MFM probe is retracted automatically to a defined distance from the sample surface at every point of scanning, and this distance can be as near as 40 µm, thus, solving the limitation of presently available near field measurement setup. This project is to convert the magnetic forces into the electromagnetic field strength.
Expected deliveries	Computation method to convert the magnetic force distribution into electromagnetic field distribution
Name of Supervisor	Prof Tan Cher Ming/Dr. Bluse Chen
Department	Center of Reliability Science and Technology/CL Technology Co. Ltd

3.

Details	Description
Project type	UROP
Title of the project	Reliability study of high power white LEDs with water resistive coating
Abstract of the project	High power LEDs have gained a lot of attention in the past few decades due to their high efficiency, longer lifetime, better heat dissipation, etc. when compared with its predecessors. This led to wider application range for these LEDs ranging from indoor lighting to outdoor lighting, marine to space technologies, etc. Thus, LEDs have to face harsh environmental conditions such as high ambient temperature, high moisture and also UV or IR radiations. While LED chip fabrication process is a mature technology now, the packaging of LEDs is still an issue for opto-electronic industry. One of the issues is the moisture penetrating into the LED package via encapsulant which lead to many type of failures. In this project, a new resistive coating will be applied on the encapsulant surface and its moisture resistance reliability will be evaluated for LEDs when tested under varying environmental conditions. Lifetime will be compared for LEDs with and without proposed coating and the chemical changes experienced by coating during the test will be studied in detail using various tools such as optical microscopy, FTIR, SEM-EDAX, etc.
Expected deliveries	Test analysis results
Name of Supervisor	Prof Tan Cher Ming
Department	Center of Reliability Science and Technology

4.

Details	Description
Project type	UROP
Title of the project	Computational investigation of PDMS degradation mechanisms using DFT via VASP
Abstract of the project	Polydimethylsiloxane is a widely used polymer in many applications ranging from contact lenses and medical devices to elastomers; it is also present in shampoos (as dimethicone makes hair shiny and slippery), food (antifoaming agent), caulking, lubricants and heat-resistant tiles. It is also a very prominent packaging material used in opto-electronics industry. However, due to the new applications for the device, PDMS is facing a tough task to provide resistance to heat, moisture, UV, IR radiations, etc. Thus, it is very important to understand the physics of degradation underlying the PDMS failures such as thermal oxidation, hydrolysis, condensation, thermal ageing, etc. In this project, DFT will be employed to understand these failure mechanisms for PDMS and path to failures along with energy require for transitions. VASP is a commercial software which will be used to perform the above mentioned DFT calculations.
Expected deliveries	DFT computation results
Name of Supervisor	Prof Tan Cher Ming
Department	Center of Reliability Science and Technology

5.

Details	Description
Project type	UPIP
Title of the project	AI on Ultrasound Medical Treatment
Abstract of the project	Ultra-sound images are one of the most important radiological examinations in daily clinical routines. It is a useful way of examining many of the body's internal organs. The biggest challenge in ultra-sound imaging is the position of the scanner, reading from the scanner, interpreting and detection of abnormalities in an ultra-sound image, because they require specific knowledge of the field. In this project, we propose an AI system for the above-mentioned challenges. Ultrasound image classification based on deep learning algorithms (i.e. Text-Image Embedding network (TieNet), CNN, RNN, etc), that will diagnose, classify, generate a preliminary report and based on the classification it will recommend a concern department related to the disease. The deep learning model will be able to generate the report and recommend the concern department. This project will work with a senior emergency medical doctor who is also familiar with Deep learning, and assistance will also be obtained from the Media Lab of MIT, USA
Expected deliveries	AI algorithm
Name of Supervisor	Prof Tan Cher Ming/Dr. K.F Chen
Department	Center of Reliability Science and Technology/Chang Gung Memorial Hospital

6.

Details	Description
Project type	UPIP
Title of the project	Raman spectrometery for moisture diffusion rate determination
Abstract of the project	Many of the compounds exhibit very strong fluorescence while being excited with a laser emitting at UV-VIS region, hereby imposing severe limitation to the detection efficiency of the particular Raman system. The Raman system with variable excitation laser sources can provide a desired flexibility toward the suppression of unwanted fluorescence signal. With this Raman system, we could detect and specify the different vibrational modes of various hazardous organic compounds and some typical dyes (both fluorescent and nonfluorescent). In this project, above mentioned advantage of Raman spectroscopy with variable excitation lasers will be used to identify the moisture penetration depth into molding compounds of ICs. This is a unique work and first of its kind where moisture penetration depth will be observed using spectroscopy technique.
Expected deliveries	Moisture diffusion rate determination method
Name of Supervisor	Prof Tan Cher Ming/Dr. Bluse Chen
Department	Center of Reliability Science and Technology/CL Technology Co. Ltd

7.

Details	Description
Project type	UPIP
Title of the project	Application of acoustic microscopy for Li Ion Battery study
Abstract of the project	Li ion batteries are very hot topic of research from past few years due to their numerous advantages and their applications in E- vehicles. However, they tend to degrade over the period and its failure analysis is always conducted by destructive techniques. This requires opening the battery material and perform various characterization methods. However, in this project, we will employ acoustic microscope to perform failure analysis for the degraded batteries to observe the cracks, delamination at the edges, etc. and later verify the results using EIS parameters and other destructive characterization tools. This method can also serve as a standard to eliminate the poor-quality batteries from a set of batteries and will be very helpful for the battery industry.
Expected deliveries	Internal battery 3D images
Name of Supervisor	Prof Tan Cher Ming/Dr. Bluse Chen
Department	Center of Reliability Science and Technology/CL Technology Co. Ltd

8.

Details	Description
Project type	UROP
Title of the project	***DFT Simulations for Effects of Radiation on IC dielectric materials***
Abstract of the project	High-k or low-k dielectrics are used in today integrated circuits. The effects of radiation on dielectrics will be studied to understand and predict radiation induced degradation of materials and components in this project. DFT simulations will be used to carry out the tasks and compared with experimental data.
Expected deliveries	DFT Simulation of dielectric material (high-k and low-k) incorporating radiation effects such as defects, trap zone formations etc.
Name of Supervisor	Prof Tan Cher Ming
Department	Center for Reliability Science and Technology

Details	Description
Project type	UROP
Title of the project	***DFT Simulations for Effects of Radiation on IC interconnect materials***
Abstract of the project	The conductive paths carrying the electrical signals are known as interconnects. These are generally made using metallic conductors. The effects of radiation on metals will be studied to understand and predict radiation induced degradation of materials and components. DFT simulations will be used to carry out the tasks.
Expected deliveries	DFT Simulation of interconnect material (copper) incorporating radiation effects
Name of Supervisor	Prof Tan Cher Ming
Department	Center for Reliability Science and Technology

Details	Description
Project type	UROP
Title of the project	***DFT Simulations for Effects of Radiation on IC semiconductor materials***
Abstract of the project	CMOS devices are the underlying basis of many a facets of technology today used for a wide range of applications, ranging from high-to-mid end mobile, consumer applications, AI, networking, 5G infrastructure, GPU, IoT, and high-performance computing, thus the study of radiation impact takes the front seat. Due to the reduction of the dimensions of transistors and interconnects, variations of the electrical characteristics in scaled silicon CMOS devices are significant. At technologies with critical dimensions at 0.13 μm and below, the impact of radiation becomes even more visible. As the dimensions of semiconductor reduces but the diameter of the beam size remains constant. Several property variations have been reported. The main objective of this project is to study the impact of radiation on semiconductor materials in modern day sub-micron ICs. DFT simulations will be used to carry out the tasks.
Expected deliveries	DFT Simulation of semiconductor (both silicon and Si-Ge) materials incorporating radiation effects
Name of Supervisor	Prof Tan Cher Ming
Department	Center for Reliability Science and Technology