# 東海大學國際學院

# 永續科學與工程學士學位學程

## Sustainability Science and Engineering Program

# 109 學年報告書

# 目錄

# 壹、 系所簡介

延續優質國際化教育方針，東海大學推出全英語教學、以綠色博雅為導向、兼顧人文與永續思維的「國際學院」，聘請海內外知名的學者、專家所組成的卓越師資群，於 2016 年開辦四年制的「永續科學與工程學士學位學程」課程。

東海大學國際學院取經美國之通識課程「國際領導課程」，並輔以 Mentor Program (聘請美國應屆畢業生來校擔任學生 Mentor)、Mini-semester 制度 (聘請海外教授來校授課)，成為台灣真正全英語教學國際學院之首例。

1. 具全球觀點、永續發展、培養思考及解決問題能力的課程
2. 具科學基礎、工程內涵、商業知識與人文素養的訓練
3. 完整全英文的學習環境及生活輔導機制
4. 與獨特英語全英語通識教育課程，培養綠色博雅的價值觀
5. 歐美學校合作之海外研習機會

## 1.1 發展特色

東海大學國際學院全英語授課，旨在培育跨領域思考、國際思維、創新創業的人才。開設有國際經營管理及永續科學與工程學士課程。

1. 對本土學生而言，課程設計是以全球的觀點，討論我國面臨的永續發展的瓶瓶頸及解決方案。對境外生而言，則以區域性議題吸引學生並引導其思考及解決問題的能力。
2. 需修習國際學院既有的 Global Leadership Honors Program，培養綠色博雅的價值觀。
3. 提供基礎數學及科學、基礎商業知識與工程基礎能力的訓練。
4. 學程專業必修課程涵蓋之關鍵永續發展議題包括：氣候變遷與調適、能源與資源管理、環境安全與衛生、永續都會設計、永續治理與政策、永續性的經濟與社會體系。
5. 高年級課程注重於個案分析、實作實習、針對特定議題提出創新性且符合永續發展的解決方案。

國際學院與美國以博雅教育著名的三一大學(Trinity University)、美國羅德島大學(The University of Rhode Island)、美國天普大學(Temple University)、英國諾丁漢倫特大學 (Nottingham Trent University)、法國雷恩管理學院 (Rennes Business College) 、美國安德烈大學 (Andrews University) 等多所名校進行 2+2、3+1、3+2 雙聯學位合作計畫，畢業後有機會取得雙學位。在全英語的學習及生活環境中，經由課堂聽講、個案討論以及海外研習，使臺灣學生與外籍生共同體認不同文化，研讀彼此關心的議題，是與國際接軌的最佳捷徑。

## 1.2 教育目標與核心能力

| 學系教育目標 Education Goals |
| --- |
| 1. 培育了解地方、區域、乃至全球面臨的關鍵永續發展議題，包括創造宜居的環境、公義的社會、健全的經濟體系。 |
| 2. 使學生獲得堅實的基礎科學、工程知識及實務的技能，以宏觀的思維分析各種永續發展的議題，並以跨領域的做法提出解決的方案。 |
| 3. 塑造具創新思維、良好溝通能力，且有團隊精神的領導人才。 |
| 4. 在永續發展的思維下，培育學生創新創業的動機和能力。 |

| 學生核心能力 Core Concepts |
| --- |
| 1. 建立學生具備全球的視野與思維，理解永續發展的挑戰及解決方案之能力。 |
| 2. 具備基礎數學及科學、商業知識與工程基礎能力，以及應用於解決問題的之能力。 |
| 3. 具備永續的價值觀、博雅的內蘊，以及關懷並服務社會的能力與精神。 |
| 4. 具備跨領域思維的能力，能以永續發展為中心價值，面對問題能提出宏觀性的解決方式。 |
| 5. 具備創新與創業的前瞻思維。 |

# 貳、 系主任的話

The word “Sustainability” is a rather broad term that encompasses a concept, a strategy, and an action. But in principle, the ultimate purpose of “sustainability” is to help the growth of a society, in an economically and environmentally sustainable way. That society can be referred to a small community (such as a campus or a township) or a larger population (such as a large city, a country, or trans-boundary territories). It is very difficult to discuss sustainability in a large scale, and often it falls into a jargon instead of something meaningful and doable.

So we would like to focus our definition of “sustainability” on community development and corporate business, which is far more realistic and tangible for students. But even so, we feel that students in today’s higher education in Taiwan are not equipped to face the challenges of developing a community or running a corporate sustainably. For example, when a city is planning for a long-term development plan, who is best-suited to join a team to take on the task? Who has the ability to have the vision, the technical knowledge, the business mind, and the people skill to lead or to be part of the task team? Similarly, when a corporate is developing a business plan or an operational plan, what type of a person with the right training is fitted for the job? Who has the vision and the capacity to help his company develop a competitive product, cost effectively, and in a sustainable way? On-job training is imperative, but the right education in school plants the seed to reach his or her capacity. I can tell you this: more than a few times company top managers asked me to recommend students who have good marketing skills and with a technical background. I simply told them that, with today’s education system, you would have to be very lucky to run into someone that fits the bill. So, you can imagine how hard it is to train young people to have sufficient technical background, with a decent marketing capacity, while having sustainability ingrained in his mind.

But that exactly what we need in today’s job market, young people who have the necessary knowledge, the people skill, and the mind of sustainable development. Our Sustainability Science and Engineering program is comprised of three curriculum categories: First, the “Global Leadership Program” to develop visions and business and leadership skills; second, the core science and engineering courses that prepare students to be the driver of a circular economy; third, a “capstone” program to expose students with real-world problems in the forms of community-based design projects and internships. We expect our students to be important contributors to the sustainable development of both the communities they live in and the companies they work for.

# 參、 員額及設備

## 3.1 師資

| 姓名 | 職稱 | 學歷 | 專業領域 |
|---|---|---|---|
| **John Jaime Perez Coca 斐海明** | 助理教授 | 國立中興大學<br>生物科技學博士 | 生物技術 |
| **Mrinalini Mishra 蜜希菈** | 助理教授 | 日本筑波大學<br>材料科學與工程博士 | 再生能源、綠色化學、材料科學與工程、物理學 |
| **Muhammad Omar Shaikh 施漢文** | 助理教授 | 南台科技大學<br>機械工程系機電科技博士 | 奈米科技、綠色材料、智能傳感器、太陽能 |

## 3.2 學程學生數

本系每一年級為一班，招生方式則分為特殊選才、繁星推薦、學測個人申請、指定考科入學，與外籍生審查，學生必須依循簡章上相關規定提出申請。

| 年級 | 人數 |
|---|---|
| 一年級 | 32 |
| 二年級 | 14 |
| 三年級 | 21 |
| 四年級 | 33 |
| 總計 | 100 |

# 肆、 學生學習活動

## 4.1 學生實習

**109 學年學生實習**

| 編號 | 姓名 | 實習機構名稱 |
|---|---|---|
| 1 | 林O哲 | 對味好食股份有限公司 |
| 2 | 張　O | 財團法人臺灣永續能源研究基金會 |
| 3 | 張　O | 財團法人中鼎教育基金會 |
| 4 | 許O平 | 財團法人台北市教會聚會所網路資訊中心 |
| 5 | 孫O博 | 麥邁景觀設計顧問有限公司 |
| 6 | 孫O博 | 城鄉永續發展有限公司 |
| 7 | 洪O書 | 笠毅工業股份有限公司 |
| 8 | 施O蓁 | 達和環保服務股份有限公司 |
| 9 | 林O瑜 | 御祥股份有限公司 |
| 10 | 李O良 | 石門山綠資本有限公司/ Mt. Stonegate |
| 11 | 羅O秋 | 笠毅工業股份有限公司 |

## 4.2 學生專題研究計畫

### IC Students Shoot for the Stars, Land at Science Museum

While neither NASA nor Elon Musk have yet managed to put a human on Mars, International College students have now been there and back—twice.

As a part of the Taiwan Ministry of Science and Technology and Tunghai University College of Science-sponsored Mission Mars competition, an enterprising group of Sustainability Science & Engineering students designed and built a concept Martian habitat that could one day house humans living on the red planet. The event, now in its fifth year, is held annually at the National Museum of Natural Science in Taichung and aims to inspire students to work through unique problems using scientific methods. Students from 13 departments and colleges across the university participated this year, including from the College of Architecture, College of Agriculture, and Department of Fine Arts.

Following last year's well-received entries from SSE, expectations were astronomically high for this year's team, which includes both veterans from 2019 and freshman under the guidance of Assistant Professors Mishra Mrinalini and John Perez. Using last year's work as a launch pad, they worked day and night to build displays demonstrating solutions to the multitudinous challenges that will face any humans who venture to the Red Planet. SSE seniors Francisca Tania and Florenth Sanjaya emphasized both the number and gravity of tough situations making life on Mars difficult.

"You want somebody to be able to start a community, survive, and not die within days or weeks."

"Live long and prosper" might be a long way off. Astronauts will need energy, food, water and breathable air, not to mention protection from radiation and toxic dust storms. This year's exhibit featured a model underground habitat that could help mitigate some of the worst of the dangers, as well as a working fuel cell for energy and a hydroponics system for food and oxygen. Displays also demonstrated how diatoms could feed fish and produce oxygen, while earthworms could treat human waste. Although this year's exhibit has already concluded, the project might live on as part of a collaboration with the Department of Architecture. But no matter what, these IC students have proven that they really are stars.

## Senior Projects Advance Sustainability Science

One thing that sets the International College's Sustainability Science and Engineering (SSE) program apart is its project component. Every year, students must design a project that gives them hands-on experience dealing with sustainability issues in the local community. Projects range from surveying environmental consciousness and analyzing air and water quality to synthesizing new materials and developing sustainable technologies.

The senior project is the capstone of the SSE project program. This year, some seniors have decided to head outdoors to get their feet wet working in local ecosystems, while others have decided to stay inside and perform lab-based experiments.

Take SSE Senior Nixon Anthony as an example. Every week, Anthony trudges out into the Dali River in the Wuri District of Taichung in order to collect samples of micro-plastics in the water. Rivers are a major source of the 1.0-2.5 million tons of plastic that end up in the ocean each year, and working with faculty advisor Lecturer Falk Schneider, Anthony hopes to determine how much impact the plastic companies along the Dali's tributaries have on the overall level of micro-plastics in the river.

SSE Senior Elvis Ye is also working outdoors but on a project that keeps him warm and dry. Working with faculty advisor Assistant Professor Mrinalini Mishra, Ye is using Arduino microcontrollers to track the angle of the sun in order to optimize solar panel electricity generation. He hopes that this will be a cost-effective way to enhance the efficiency of solar energy.


SSE Senior Willy Xu is also working with Arduino microcontrollers and Assistant Professor Mishra for his senior project. Xu is working on optimizing energy production from piezoelectric elements – the kind that power children's LED sneakers. By changing his walking frequency and measuring the force applied by different parts of his feet, Xu hopes to maximize the energy generation potential of piezoelectric elements.

While Ye and Xu are working with new technologies, SSE Senior John Ho is working with water quality like Anthony is. However, Ho is working on cleaning up oils rather than plastics. After encountering algae with the ability to bond with oils in Assistant Professor John Perez's lab, Ho has started growing this algae in order to test under what conditions it grows best and how to isolate it from the water it grows in using cost-effective and environmentally-friendly methods. He hopes this algae can be used to clean up waterways polluted by oil, like those surrounding the Tunghai Night Market.

Seniors won't have to submit their final findings for another month or so, but we are excited to see them hard at work and already advancing their field in small ways, one data point at a time.

## 學生專題研究名單

**指導老師： John Jaime Perez Coca**

| 姓名 | 專題名稱 |
|---|---|
| 林Ｏ益 | 7 Days Inundation and Salinity Oxidative Stress as Indicators of Niche Width Preference of Mangrove Kandelia Obovata from Xingfeng Forest, Hsinchu County, Taiwan |
| 何Ｏ翰 | Isolation of Algae Strains from Dajia River by Sustainability Science Students, International College, Tunghai University, Spring Semester, 2021 |
| 何Ｏ庭 | The Effects of Elevated CO2 (1000 ppm in 2100) in Stems and Leaves Changes in K. obovata |
| 陳Ｏ寰 | Sustainable Agricultural Planting (No Sunlight) |
| 呂Ｏ津 | The Effect of Salinity and Elevation Gradient in the Growth Dynamics of ROS Enzyme in Kandelia Obovata |
| 李Ｏ涵 | The Effect of LED Blue Light and LED White Light on Cherry Tomato Growth |
| 徐Ｏ雯 | Growth Level Analysis of Lactuca Sativa L. in Hydroponic and Organic Soil |
| 林Ｏ宇 | The effect of type of soil, water source and the age of plants on the health of Kandelia obovata and its possible phytoremediation potential |
| 林Ｏ瑜 | Effects of Darkness and Light Spectra on Protein and Pigments in Mung Beans |
| 粘Ｏ涵 | Diatoms as Bioindicators of Anthropogenic Pollution-Dajia River |

**指導老師： Mrinalini Mishra**

| 姓名 | 專題名稱 |
|---|---|
| 徐Ｏ澤 | Harvesting Waste Energy from Pedestrians Walking over Piezoelectric Materials with Arduino |
| 葉Ｏ昕 | Using Arduino Solar Tracker to Find Optimal Angle for Static Solar Panel from February to April |
| 黃Ｏ瑋 | Feasibility of an Alternative Solar Light Illumination System for the IC Building |
| 鄭Ｏ桓 | Low cost, Arduino Based, Portable Device for Measurement of Methane Composition in Biogas |
| 田Ｏ姬 | Analysing Heavy Metals in Water Dispensers at Tunghai University |
| 陳Ｏ芬 | Processing Coffee Pulp to Extract Lactic Acid, a Precursor for Poly-Lactic Acid, as a Feasible Monomer for Bioplastics |
| 諾Ｏ絲 | Staples Recycling Survey in Tunghai University |
| 陳Ｏ香 | Effects of Different Materials Acting as Electrodes in a Proton-Exchange Membrane Fuel Cell (PEMFC) on its Efficiency |

**指導老師： Muhammad Omar Motamid Shaikh**

| 姓名 | 專題名稱 |
|---|---|
| 魏Ｏ富 | Monitoring Water Quality at Eco-Village in Tunghai University |

**指導老師： Falk Schneider**

| 姓名 | 專題名稱 |
|---|---|
| 許Ｏ平 | Improving the Environment for Pedestrians around Tunghai Night Market in Taiwan |
| 陳Ｏ駿 | An LCA of Contact lenses |
| 周Ｏ喜 | Daily Usage of Plastic Bag: Survey on People’s Perspective and Behavior towards Plastic Bag Usage and Reduction |
| 苗Ｏ書 | Understanding Sustainability and Climate Change through Trash Art |
| 洪Ｏ書 | Influence of Plastic Pellet Producing Companies on Floating Microplastics in urban runoffs in Central Taiwan |
| 施Ｏ蓁 | The Feasibility of Wind Turbine Blades Recycling in Taiwan |

## 4.3 系學會活動

- **新生迎新宿營 IC CAMP**

  為國際學院三天兩夜之迎新活動，內容由團康活動、大地遊戲、RPG等活動結合而成。透過此次活動讓大一新生們更加熟識彼此以及培養團結合作及榮譽精神。

- **萬聖節 Halloween Party**

  為使國際學院學生體驗國外氣氛舉辦萬聖節活動，慶祝同時也增進學生對於國外文化的了解；藉由此活動不僅能增進兩學程之間的情感，更能拓展自己的交友圈。

- **聖誕節 Polar Chris**

  因學程由來自不同國家學生所組成，希冀能透過活動體驗不同的文化特色，由此建構多元文化調適能力，有別以往的體驗大學生活。

- **制服日 Uniform Day**

  藉由制服日的活動，重溫高中的點滴並促進本學程學生的互動，並讓參與者可以開拓自己的交友圈。

- **二校雙週 Second Campus Activities**

  二校區各系系學會透過東海大學第二校區為期兩週的活動，想帶給東海大學全體師生不同的活動體驗，讓二校區的同學們在大學生活中增添一筆特別的回憶，同時也歡迎一校區的同學參加。


# 伍、 教師與學生獲獎

## 教師獲獎紀錄

| 姓名 | 獲獎名稱 | 審核單位 |
|---|---|---|
| Mrinalini Mishra | 109 學年度專任教師學術著作獎勵 | 學術審議委員會 |

## 學生獲獎紀錄

### 書卷獎

| 部別 | 系級 | 姓名 | 獎學金金額 |
|---|---|---|---|
| 大學部 | 永續一 | 費O霓 | 10,000 |
| 大學部 | 永續一 | 傅O庭 | 5,000 |
| 大學部 | 永續二 | 藍O彤 | 10,000 |
| 大學部 | 永續二 | 馬O沙 | 5,000 |
| 大學部 | 永續三 | 洪O恩 | 10,000 |
| 大學部 | 永續三 | 方O云 | 5,000 |

### 109 學年度榮譽學生

依據本校學則第三十四條規定:學士班學生在本校修業一年以上，騎上一學年成績達下列各款標準者，榮譽學生。

一、學年學業平均成績達八十五分以上者。

二、學期科目各科成績達七十分以上者。

三、學年科目平均成績達七十分以上者。

四、名列本班前百分之五以內者。

| 部別 | 級別 | 學生姓名 |
|---|---|---|
| 大學部 | 永續二 | 藍O彤 |
| 大學部 | 永續三 | 洪O恩 |
| 大學部 | 永續四 | 葉O昕 |

# 陸、 綜合研究成果

## 6.1 教師發表研討論論文

Assistant Professor Dr. Mrinalini Mishra has had recent achievements in research and other collaborations. Dr. Mishra's research on nanoparticles that harness sunlight to split water into hydrogen gas and oxygen was published in "ACS Applied Materials & Interfaces" on January 15, 2021.

## 6.2 出席國際會議情形

2020/11/28

Mrinalini Mishra 助理教授

The 2020 International Conference on Green Electrochemical Technologies and the 2020 Annual Meeting of Electrochemical Society of Taiwan

# 柒、 國際交流活動

## 7.1 雙聯學位

**1. 美洲**

| 編號 | 學校 |
|---|---|
| 1 | Temple University 天普大學<br>(3+2 東海學士+天普碩士) |
| 2 | University of South Florida 南佛羅里達大學<br>(4+1 東海學士+USF 碩士) |

**2. 歐洲**

| 國家 | 編號 | 學校 |
|---|---|---|
| 法國 | 1 | ESC Rennes School of Business 雷恩斯管理學院<br>(3+1 東海+ESC 學士、3+1.5 東海學士+ESC 碩士) |

**3. 大洋洲**

| 編號 | 學校 |
|---|---|
| 1 | University of New South Wales 新南威爾斯大學<br>(3+1+N 東海學士+UNSW 碩士) |

## 7.2 進修交流

東海大學王茂駿校長與傅爾布萊特基金會執行長那原道博士(Dr. Randall Nadeau)於 2020 年 11 月 12 日簽署與「臺美高教聯盟 The Consortium for Study Abroad in Taiwan (CSAT) 」合作協議，共同舉辦臺美暑期國際夏日課程「Summer Mini-Semester」計畫，於 2021 年 5 月 23 日至 6 月 25 日間，邀請美國師生到本校國際學院進行移地教學，透過多校師生學術交流與多元對話，期引領臺美學子跨越國界與制度的框架，提供更多元的探索與選擇機會。

本計畫為期五週，由本校國際學院和逾十所美國姊妹校共同規劃，以「通識暨華語課程」、「永續科學」及「商業管理」領域為軸，開設超過 20 門專業學分密集全英課程，同時輔以豐富精采的在地文化體驗與參訪行程，讓美國師生切身感受匯聚亞洲文化的精采臺式魅力。


Summer Mini-Semester 簽約儀式

# 捌、 專題報導

## 8.1 主題報告

東海大學國際學院舉辦 OPEN CAMPUS 院系體驗營

東海大學國際學院2020 OPEN CAMPUS於109年12月04日（週五）舉辦，活動報名踴躍，共計約百位來自全國各地高中職師生共襄盛舉。本次活動結合國際學院國經學程「孫子兵法生活實戰 Sun Zi's Art of War and Business Strategies」策略管理課程，與永續學程「綠色能源實作 Green Energy」簡介綠色能源與永續發展。課程中分別透過文化互動與分組競賽，運用孫子兵法思維，創造競爭優勢；與專業課程引領學生瞭解現今綠色能源潮流趨勢。

活動最後由國際學院獨有之 Mentor Program 外籍助教帶領學生進行各種遊戲體驗，深入瞭解國際學院獨一無二的氛圍，展現國際學院跨文化特色，提供更多元的探索與選擇機會。

參與師生在活動中感受東海大學國際學院獨有的全英語環境，在兩學程的人文與永續理念兼顧下，透過實作與遊戲，加深多元文化之深度，展現國際學院的特色與亮點期能提供高中生深入淺出體驗大學知識的渠道。

## 8.2 活動花絮

**OPEN CAMPUS 院系體驗營**

**Summer Mini-Semester 校外參訪**

# 玖、 職涯發展

## 9.1 畢業生流向

### 109 學年畢業生考取研究所榜單

永續學程研究所榜單，共計 7 人。

**亞洲地區及大洋洲地區**

| 姓名 | 錄取學校 |
|---|---|
| 葉O昕 | 1. 臺灣國立中央大學能源工程研究所 |
| 施O蓁 | 1. 澳洲墨爾本大學 Master of environments<br>2. 紐西蘭梅西大學 Master of Sustainable Development Goals (Global Development) |
| 鄭O桓 | 1. 臺灣國立彰化師範大學電機工程學系碩士班 |
| 粘O涵 | 1. 臺灣東海大學環境科學與工程學系碩士班<br>2. 臺灣國立東華大學海洋生物研究所<br>3. 臺灣國立海洋大學海洋環境與生態研究所<br>4. 澳洲詹姆士庫克大學 Marine biology<br>5. 澳洲塔斯馬尼亞大學 Marine and Antarctic Science |
| 田O姬 | 1. 臺灣臺北醫學大學全球衛生暨發展碩士學位學程 |
| 陳O香 | 1. 臺灣國立台灣科技大學材料科學與工程學系暨研究所 |
| 苗O書 | 1. 臺灣國立中興大學農業經濟與行銷碩士學位學程 |

**歐美地區**

| 姓名 | 錄取學校 |
|---|---|
| 施O蓁 | 1. 瑞典隆德大學 Master of Science Programme in Service Management, Sustainable Service Management<br>2. 荷蘭格羅寧根大學 MSc in Sustainable Entrepreneurship<br>3. 愛爾蘭都柏林理工大學 MSc in Sustainable Development |

# 壹拾、 109 學年捐款芳名錄

| 編號 | 姓名 |
|---|---|
| 1 | Ms. Shirley Sywn-Tien Hsiao and Mr. An-Chi Lee |
| 2 | Mr. & Mrs. Teddy Chien |
| 3 | Tsungchu Chien |
| 4 | Ms. Sywn Yi Hsiao |
| 5 | Mr. & Mrs. Ituan C. Wang |
| 6 | Mr. Max T. M. Ming |
| 7 | Jiang-kow and Wang Pin-Ju Ho |
| 8 | Mrs. Terry Shu-Yen Lee |
| 9 | Mrs. I-min Beth Wu |
| 10 | Mrs. Alice Cheng |
| 11 | Dr. Wallace I. Yuan |
| 12 | David Hsiao-Pai Shen |
| 13 | Mr. Edward T. Chen |
| 14 | Dr. & Mrs. Kelvin Shen |
| 15 | Mei Lynn |
| 16 | Maan W. Arthur |
| 17 | Mr. Hsiang W. Chen |
| 18 | Yang Family Foundation |
| 19 | Shirley Hsiao |