Innovation and Entrepreneurship in Engineering Education

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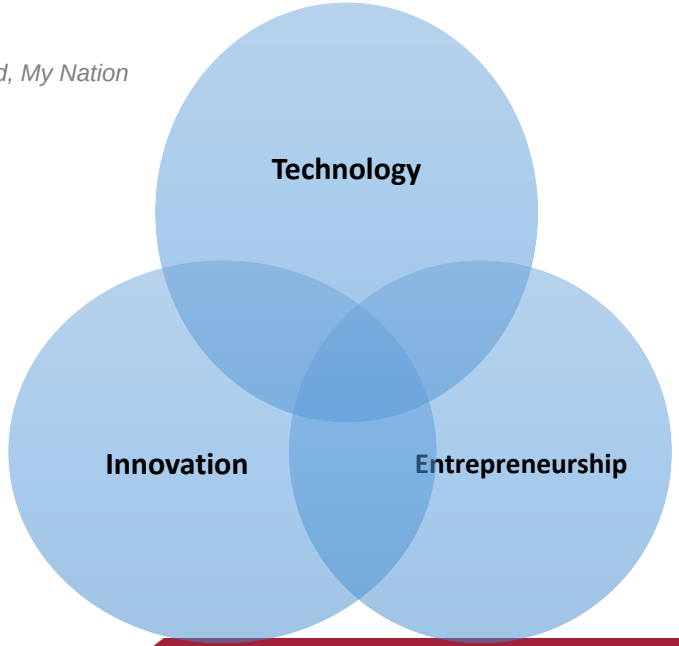
Opening Minds • Shaping the Future
啟迪思維 • 成就未來

The T.I.E.

"**Innovation** drives **technology** growth
Entrepreneurship consummates innovation"

Patri K. Venuvinod (2011),

Techology, Innovation and Entrepreneurship: Part 1: My world, My Nation



THE HONG KONG POLYTECHNIC UNIVERSITY
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T.I.E. education at Faculty of Engineering

Technology

Fundamental knowledge from various disciplines:

- Biomedical Engineering,
- Computing Science
- Mechanical Engineering
- Electrical Engineering,
- Electronic and Information Engineering,
- Industrial and Systems Engineering
- Aeronautical and Aviation Engineering

Innovation

Knowledge facilitating innovation process:

e.g. research methods, product design, process design, system design, analytics, etc.

Entrepreneurship

Knowledge relating to entrepreneurial process:

- New product development
- Business plan/model
- Engineering economics
- Supply chain operations
- Project management
- Marketing etc.

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Subjects offered by Faculty of Engineering

ENG 1003 Freshmen Seminar- Entrepreneurship Projects

- Concepts of Innovation and Entrepreneurship
- Development of simple business plan

Various discipline subjects

ENG 4001 Project management
ENG 3003 Engineering Management
ENG 3004 Society and the Engineer

Year 1

Year 2+3

Year 3+4

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Subjects offered by Department of Industrial and Systems Engineering

BEng (Hons) Industrial and Systems Engineering
BSc (Hons) Enterprise Engineering with Management
BSc (Hons) Logistics Engineering with Management
BEng (Hons) Product Engineering with Marketing

ISE 376 “Entrepreneurship and Innovation”
ISE 4006 “Integrative studies in enterprise systems and management”
ISE 418 “Computer-Aided Product Design”
ISE 430 “New product planning and development”
ISE 431 “Engineering costing and evaluation”
ISE 457 “Business process management”
ISE450 “ Simulation of logistics systems”
.....

Postgraduate level:

ISE549 “Management of Innovation and Technology”
ISE559 ”Tecnology Audit and Assessment”
ISE5001 “Technoloy Transfer and Commercialization”
ISE5018 “Intellectural property management and strategies”
ISE5022 “Financial decision analysis for technology management”

Subjects offered by Department of Industrial and Systems Engineering

ISE 376 " Entrepreneurship and Innovation

Indicative Syllabus

1. Overview of Entrepreneurship
2. Understanding Industry Context and Entrepreneurship Strategies
3. Introduction of Innovation Types
4. Implementation of Innovation

Intended Learning Outcomes

Upon completion of the subject, students will be able to

1. Understand entrepreneurship strategies in which innovation is an important part of business and corporate strategy
2. Recognize various types of innovations and their processes
3. Apply the techniques involved in assessing corporate ventures
4. Evaluate the management of innovative business development or processes from a strategic and contemporary viewpoint.

PolyU Student Entrepreneurial Proof-of-Concept Funding Scheme Awardee 2017

Initiation:

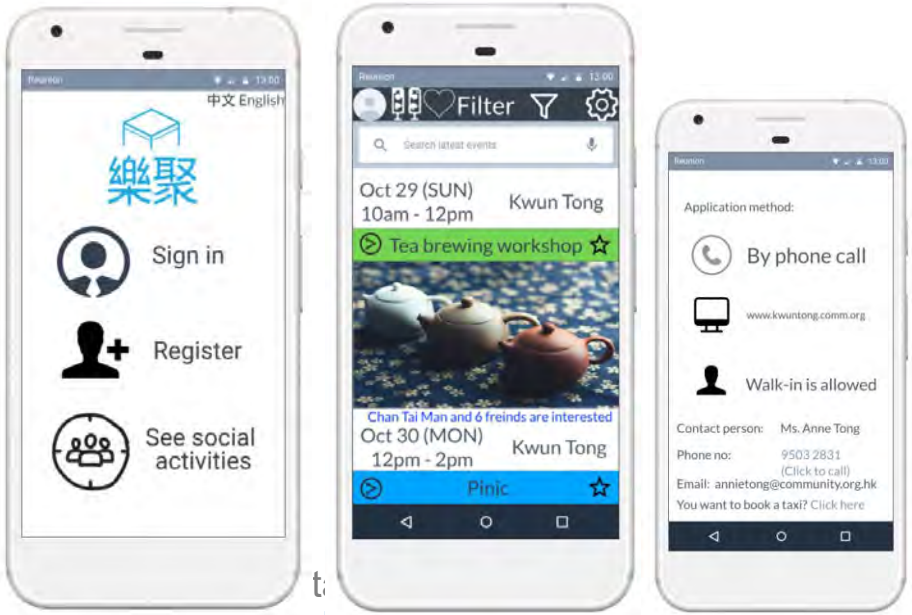
Won an in-class business competition held in course **ISE376: Entrepreneurship and Innovation**

Startup Vision: Improve well-being of elderlies

Deliverables:

- Re-invented our startup idea and Developed a market-proof startup project
- Built a prototype for our mobile application
- Conducted a market research by interviewing caregivers, members in the district council, social workers, healthcare professionals and collecting surveys from elderlies
- Won second-runner up in a joint-university business competition

Prototype (https://marvelapp.com/b8aj6ge/screen/36975183):



https://www.neallumhk.com/

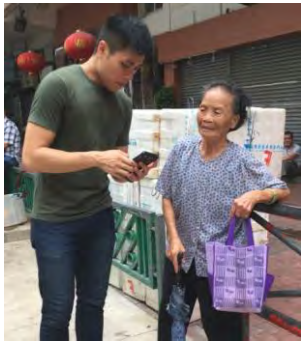
PolyU Student Entrepreneurial Proof-of-Concept Funding Scheme Awardee 2017

Market research:

- Collected 113 surveys from elderlies and their caregivers

Visit to a community centre

Collecting surveys in a voluntary activity



Interviewed social workers and volunteers

Achievements:

- Second runner-up in 10th Shadow Entrepreneur business competition by Hong Kong City Junior Chamber
- Involved, collaborated and inspired with students from other disciplines in PolyU (Computing & Nursing)

ISE Student develops the most energy-efficient LED filament lamps

> Found a local start-up

> Focus on innovative and advance LED lighting solution

> Awardee for PolyU Innovation & Entrepreneurship campaign

– PolyU Microfund

> Granted patent technology

> Successfully developed an 「Innovative LED Filament Bulb」

舊生獲資助研究 開公司盼投產

理大發明最省電LED燈

主編推介

【明報專訊】理工大學學生在畢業論文研究燈泡贏賞識，獲「理大微型基金」撥款10萬元，讓他畢業後繼續研究，最終在教授協助下，研發出市場上最省電的LED燈絲技術，理大已爲技術申請專利，3名理大舊生已成立公司，目標是今年內將產品推出市場。

日用8小時 一年電費33元

理大畢業生趙崇智(右)獲指導老師杜雪(左)賞識，並獲理大資助10萬元繼續研究，終研發出市場上最省電的LED燈絲技術，期望今年推出市場。圖中趙手中的是其研發的新式LED燈泡，而杜手中的為傳統LED燈泡。(李紹昌攝)

頭條日報 28 • LOCAL NEWS 港聞 THU 09 | 03 | 2017

WWW.STHEADLINE.COM

理大生研最慳電燈泡 今年面世

香港理工大學畢業生有機會實現畢業論文所構思的燈泡，最終成功研發市場上最慳電燈泡！新型「LED燈絲燈」的發光效率高達一百二十九瓦特，約為傳統LED燈的一點五倍，以每日使用八小時計算，一年電費僅三十三元，預料有關產品於今年內會推出市場。

理大工業及系統工程學系畢業生趙崇智(圖左)的畢業論文，獲「理大微型基金」撥款十萬元，去年在理大「超精密加工技術國家重點實驗室」副主任杜雪團隊協助下，研發出LED燈絲技術。

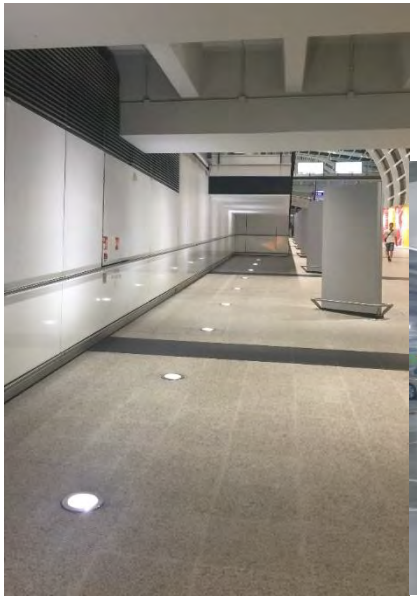
新型LED燈絲技術的發光效率達一百二十九瓦特，約為傳統LED燈的一點五倍，能源效益超越現時市場上的通用照明產品。

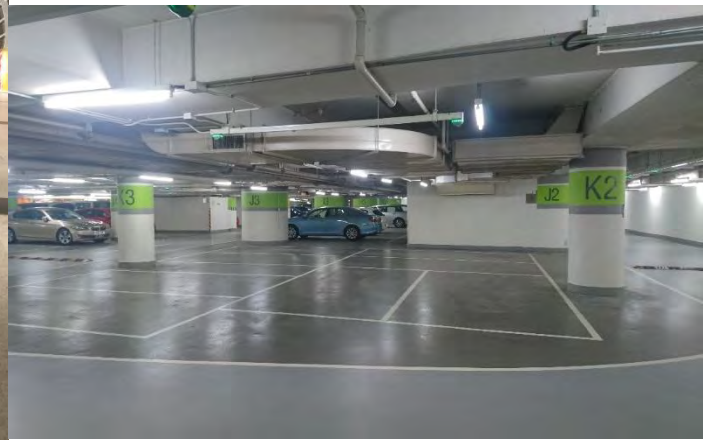
而新型LED燈絲燈的預期壽命長達五萬小時，是傳統LED燈泡的兩倍，生產成本每個為二十元，僅為傳統LED燈泡的一半。

趙崇智指已成立公司，技術的專利申請已獲受理，現正與數間公司商討合作，推出有關產品，預計每個燈泡售價四十五元，是傳統LED燈泡的一半，與市面上的慳電膽相若。

Related news and report

Applications





Testing in site

Exhibitions and promotions

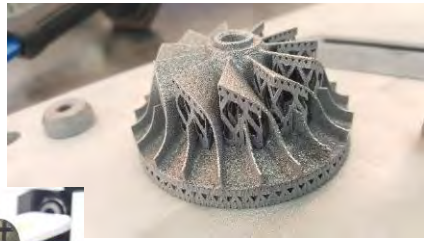
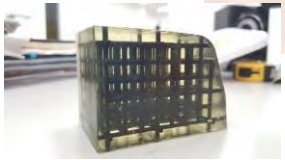
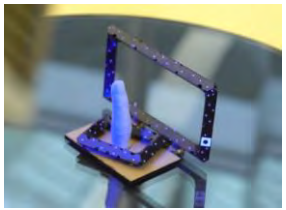
Facilities

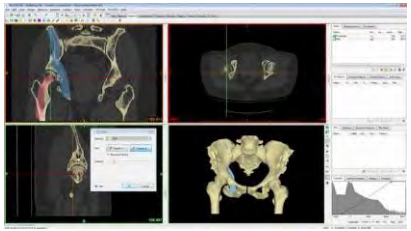
1. U3DP Facilities

> **3D Printing Equipment**
- SLM Powder-bed Metal 3D Printing Machines
- 3D Printed Electronic System
- Large Format FDM 3D Printer
- Multi-Color, Multi-Material 3D Printer
- 3D Bioplotter
- Desktop 3D Printers

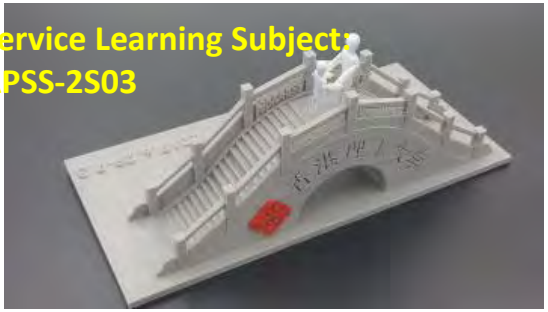
> **3D Scanning and Sculpting Equipment**
- Hi Precision 3D Scanner
- Handheld 3D Scanner
- Digital Sculpting Devices

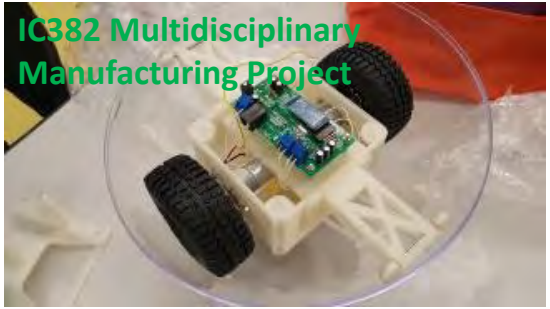
> **3D Printing Software**
- Mimic & 3-matic Medical 3D Printing Software
- Magic 3D Printing Software
- Geomagic Design X (Scan data to CAD data)
- solidThinking (Topology Optimization)



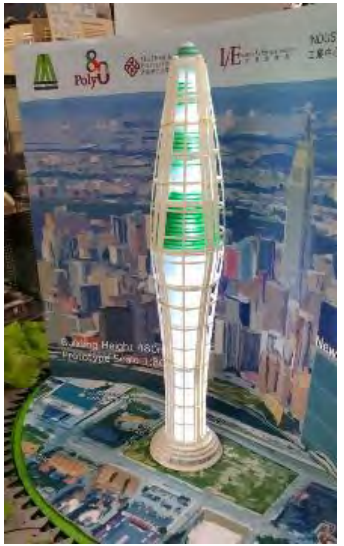
Learning & Teaching in Faculty of Engineering





Support Student Project Competition

- Supported Student Project Competition (1st Runner up of Global Grand Challenges Summit (GGCS), InnoCarnival 2016, Mitsubishi electric automation student completion, etc.
- Supported PolyU Racing Team on the production of 3D printed composite tooling

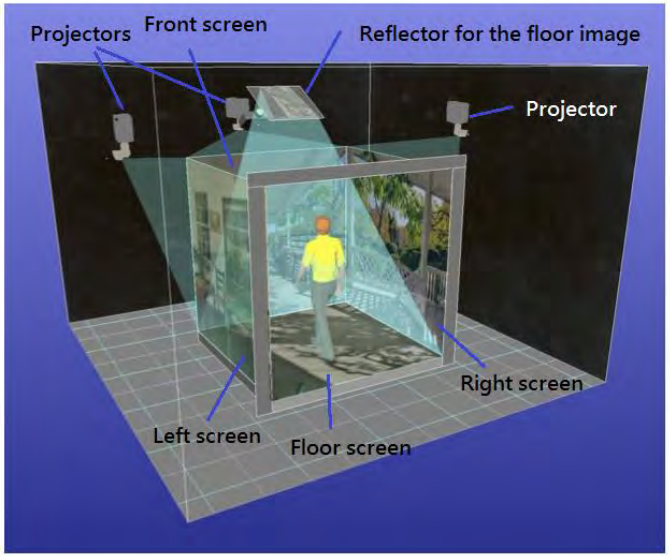


2. Ng Tat Lun Digital Factory

Computer-aided Design

Virtual Manufacturing Simulation

3. Cave Automatic Virtual Environment (CAVE) System



- 3D simulation
- Training environments
- Product Design Review
- Virtual Tour

4. 5-axis Numerical Control X-ray 3D Computed Tomography Machine

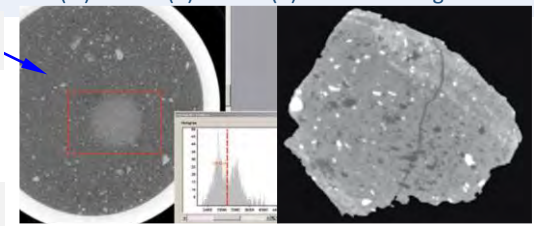
Highlighted features:

- Dual X-ray tubes: 190 kV & 225 kV
- High resolution: reach 0.15 μm (150 nm)
- Inspection sample: up to Ø300 × 500 mm & 30 kg
- Measurement accuracy: conform to the metrology standard VDE/VDI 2630
- System size & weight: 2990 (w) × 1550 (d) × 2220 (h) mm & 6900 kg

3D model of an automotive die-casting component after CT reconstruction

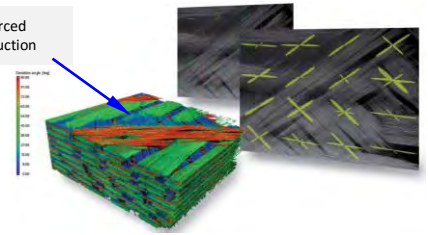
1. Non-destructive inspection and geometrical measurement

X-ray slice image of a porous structure



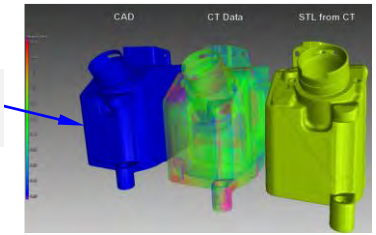
2. Material structure analysis

3D model of a fibre- reinforced composite after CT reconstruction



3. Composite material identification

The CAD model can be created quickly based on CT data



4. Reverse engineering

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THANK YOU