RGC Ref. No.: UGC/IDS(R)24/19 (please insert ref. above)

RESEARCH GRANTS COUNCIL COMPETITIVE RESEARCH FUNDING SCHEMES FOR THE LOCAL SELF-FINANCING DEGREE SECTOR

INSTITUTIONAL DEVELOPMENT SCHEME (IDS) RESEARCH INFRASTRUCTURE GRANT

Completion Report

(for completed projects only)

Submission Deadlines:	1.	Auditor's report with unspent balance, if any: within <u>six</u> months of the approved project completion date.
	2.	<i>Completion report: within</i> <u>12</u> <i>months of the approved project completion date.</i>

Important Note:

In completing the report, please use the following format:				
Page limit:	Items 1 to 5 and Summary of Completion Report: no page limit			
	Items 6 to 9: maximum <u>20 A4 pages</u> (excluding any appendices and attachments)			
Font:	Times New Roman			
Font Size:	Not smaller than Point 12			
Margin:	Two centimeters margin all around			
Spacing:	Single-line spacing			

1. Project Title

Establish the Research Centre for Advanced Design, Materials and Manufacturing

Technologies (RCADMM) in PolyU SPEED

2. Investigator(s) and Academic Department(s) / Unit(s) Involved[#]

Project Team	Name / Post	Department / Unit	Average Number of Hours Per Week Spent on this Project
Project holder [*] (i.e. Head of Institution)	Professor LEUNG Chun-wah / Interim Director	Director's Office	15
Team leader	Professor LEUNG Chun-wah / Interim Director	Director's Office	15
Deputy team leader	Dr NG Zerance Sun-pui / Associate Division Head also Principal Lecturer	Division of Science, Engineering, and Health Studies	8

Team member	Dr LOH Anthony Wai-keung / Division Head also Principal Lecturer	Division of Science, Engineering, and Health Studies	6
Team member	Dr CHAU James Chun-pong / Associate Division Head also Principal Lecturer	Division of Science, Engineering, and Health Studies	6
Team member	Dr KAHANGAMAGE Udaya / Senior Lecturer	Division of Science, Engineering and Health Studies	6
Team member	Dr VYAS Anand / Lecturer (Successor of Dr WOO Eric Kin-sang. Approved by RGC on 02/09/2020)	Division of Science, Engineering, and Health Studies	6
Associate Team Member	Mr KONG Stephen Chin-wang / Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member	Dr LAM Antony King-cheong / Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member	Dr LAM Coriolanus Choi-ling / Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member	Dr LAM Edmond Wai-ming / Senior Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member	Dr LIANG Junot Shan-jun / Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member	Dr LUI Anthony Ki / Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member	Dr MAK Ricky Kai-long / Senior Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member	Dr NG Maggie Ka-wai / Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member	Dr WONG Kelwin Kar-wai / Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member	Dr WU Andrew Yang / Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member	Dr ZHANG Flora Hao / Lecturer	Division of Science, Engineering, and	2

		Health Studies	
Associate Team Member	Dr ZHU Bo / Lecturer	Division of Science, Engineering, and Health Studies	2
Associate Team Member ³	Dr LAU Joseph Yui-yip / Senior Lecturer	Division of Business and Hospitality Management	N/A
Associate Team Member ³	Dr NG Sally Sau-yee / Senior Lecturer	Division of Science, Engineering, and Health Studies	N/A
Associate Team Member ³	Dr WONG Ka-chung / Lecturer	Division of Science, Engineering, and Health Studies	N/A
Associate Team Member ³	Dr SUN Vera Nim-yan / Senior Lecturer	Division of Social Sciences, Humanities and Design	N/A
Associate Team Member ³	Dr TONG Esther Ka-man / Division Head	Division of Language and Communication	N/A
Associate Team Member ³	Mr WONG Martin Chung-yu / Lecturer	Division of Social Sciences, Humanities and Design	N/A
Associate Team Member ³	Dr WUT Edmund Tai-ming/ Senior Lecturer	Division of Business and Hospitality Management	N/A
Secretary of RCADMM	Ms LAM Julia / Division Secretary	SEHS Division Office	8
Assistant Secretary of RCADMM	Ms LI Jenny / Project Assistant	General Office [Funded under this IDS Project]	45

[#] Please state the key staff and department/unit involved in the project. Please add row(s) as necessary. Please also highlight the approved changes in project team composition and quote the date of the RGC approval for such changes.

^{*} Refer to "Applicant" for 2015/16 exercise and "Project holder" for 2017/18 exercise onwards. ³ This group of Associate Team Members will participate only in those activities that are relevant to their research interest including conference or seminar on the particular topic area.

<u>Key Members of Research Centre for Advanced Design, Materials and</u> <u>Manufacturing Technologies (RCADMM) (2022)</u>





Daily operation and continuous development of the Research Centre for Advanced Design, Materials and Manufacturing Technologies (RCADMM) are fully responsible by the RCADMM Committee chaired by Prof C.W. Leung with assistance obtained from the SEHS Division Secretary – Ms Julia Lam (Secretary), and the Project Assistant hired – Ms Jenny Li (Assistant Secretary).

The important tasks are grouping into three main areas: (1) Laboratory Development, (2) Seminar and Conference Organization, and (3) Training of Research Personnel and Students. Each main area is handled by the corresponding Sub-committee which is reporting directly to the RCADMM Committee during the regular monthly meetings as shown in the diagram below:



Management Structure of RCADMM (1/1/2020 - 31/12/2022)

Function of RCADMM Committee:

Chairman: Prof C.W. I	LEUNG
Deputy Chairman: Dr	Zerance NG
Secretary: Ms Julia LA	AM
Assistant Secretary: M	s Jenny LI
Committee Members:	Dr Anthony LOH, Dr James CHAU, Dr Udaya KAHANGAMAGE,
	Dr Anand VYAS, Dr Antony LAM, Dr Coriolanus LAM,
	Dr Kelwin WONG
Co-opt Members:	Dr Edmond LAM, Dr Ricky MAK

Responsibilities:

- 1. Ensure the smooth operation and progress of the Research Centre.
- 2. Receive reports from the three Sub-committees.
- 3. Make decision on all issues related to the operation and progress of the Research Centre.
- 4. Take remedial action for item lacking behind from the Implementation Timetable (Appendix VII).
- 5. Produce progress report and completion report.
- 6. Prepare for the RGC Visit.
- 7. Control expenditures are within the Budget approved by RGC.
- 8. Assess and endorse (or otherwise) the research proposals submitted by members or associate members.
- 9. Hold meeting in the 4th week of every month and produce the Meeting Note.

Laboratory Development Sub-Committee:

Chairman: Dr Anthony LOHSecretary: Ms Jenny LICommittee Members:Dr Zerance NG, Dr Udaya KAHANGAMAGECo-opt Members:Dr James CHAU, Dr Antony LAM, Dr Ricky MAK, Dr Anthony LUI

Responsibilities:

- 1. Suggest purchasing of equipment/instruments according to the Budget approved by RGC.
- 2. Provide alternative solutions to acquire equipment/instruments instead of purchasing.
- 3. Once the suggested item is approved by the RCADMM Committee, proceed with the purchasing. For procurement of equipment, goods and services made with the funding from the RGC, ensure the purchasing meet the approved budget and requirements of RGC.
- 4. Ensure the purchased item can be supported by the existing laboratory space/facility.
- 5. Provide advice to members or associate members on acquisition of equipment/instruments while preparing research proposals.
- 6. Hold meeting in the 1st week of every month and produce the Meeting Note.

Seminar/Conference Organization Sub-Committee:

Chairman: Dr Zerance N	IG
Secretary: Ms Jenny LI	
Committee Member:	Dr Andrew WU, Dr Coriolanus LAM
Co-opt Member:	Dr Udaya KAHANGAMAGE, Dr Anand VYAS, Dr Flora ZHANG,
	Mr Stephen KONG

Responsibilities:

- 1. Communicate and secure the Speakers for every seminar once decision is made by the RCADMM Committee.
- 2. Arrange the venue and student helpers for the seminar once the date and time have been decided by the RCADMM Committee.
- 3. Make announcement of the seminar to our potential audiences.
- 4. Ensure expenditure of the seminar is within the Budget approved by RGC. Inform the RCADMM Chairman immediately before the seminar for any overspending.
- 5. Arrange at least three seminars in one year.
- 6. Organization of the conference in every year will be responsible by the RCADMM Committee. Tasks 1 4 will be carried out by the Sub-Committee and support will be provided by the other Sub-Committees, which are decided by the RCADMM Committee.
- 7. Hold meeting in the 2^{nd} week of every month and produce the Meeting Note.

Research Personnel/Student Sub-Committee:

Chairman: Dr James CH	IAU
Secretary: Ms Jenny LI	
Committee Members:	Dr Kelwin WONG, Dr Maggie NG
Co-opt Members:	Dr Edmund WUT, Dr Anand VYAS, Dr Flora ZHANG

Responsibilities:

- 1. Student researcher is recommended by the FYP Supervisor via the Programme Leader before the 2nd week of October.
- 2. Assess the recommendations and make suggestion to the RCADMM Committee for decision. Ensure the expenditure on acquiring support from part-time student assistants and research students is within the Budget approved by RGC.
- 3. Secure the appointment with SPEED and then inform the Student and the FYP Supervisor, such that they can start.
- 4. After the training period, collect the report from the FYP Supervisor via the Programme Leader.
- 5. Invitation of Visiting Scholar will be carried out by the RCADMM Chairman after it is decided by the RCADMM Committee. Arrangement of the room and payment will be responsible by the Secretary of the RCADMM Committee while the Sub-Committee provides support.
- 6. Keep record of the Associate Members and communicate with them for activities held by RCADMM.
- 7. Hold meeting in the 3rd week of every month and produce the Meeting Note.

3. **Project Duration**

	Original	Revised	Date of RGC / Institution Approval (must be quoted)
Project Start Date	1 January 2020	N/A	N/A
Project Completion Date	31 December 2022	N/A	N/A
Duration (in month)	36	N/A	N/A
Deadline for Submission of Completion Report	31 December 2023	N/A	N/A

4. Project Objectives

Summary of objectives addressed / achieved:

Objectives *	Percentage Achieved	Remarks**
 To acquire funding from various possible sources to support and sustain research activities in dealing with the community and environmental problems. 	100%	 In 2022, research projects planned to be submitted via: (a) 4 proposals to external funding, and (b) 4 proposals to internal funding. Research projects have been submitted in 2022 (as refer to Appendix I): (a) 8 proposals to FDS (3 are funded), and (b) 7 proposals to CPCE internal funding (7 are funded). For the entire project period in 2020-2022, total number of research projects have been submitted (as refer to Appendix I):
		[Refer to Appendix I (Pages 14 - 35): Total funding obtained from these proposals in addition to the starting funding of RCADMM is The experimental setups for developing these research projects are given on pages 33-35.]

2. To provide professional consultancy services to the government/ industry/ community sectors in solving problems and providing technical seminars/ workshops/ conferences.	100%	 In 2022, technical services planned to offer via: (a) 3-4 research seminars/technical workshops[#] to Government sectors, industry, universities, SPEED academics and students, (b) 3-day conference with 48 presentations to Government sectors, commercial sectors, industry, universities, SPEED academics and students, and (c) 2-3 consultancy projects/services[#] to Government sectors, universities, industry, and community.
		Technical services have been offered in 2022 (as refer to Appendix II):
		 (a.1) 4 research seminars to Government sectors, industry, universities, SPEED academics and students on 3/4; 8/8; 14/10 and 18/11. (a.2) 7 technical workshops to Government sectors, industrial/ commercial sectors, SPEED academics and Students on 21/1; 19/4; 28/6; 19/7; 29/7; 29/8 and 18/11. (b) 2-day conference (6-7/10/2022) with 35 presentations on International Conference on Advances in Design, Materials and Manufacturing Technologies 2022 (ICADMMT 2022). The conference has been offered to Government sectors, universities, industry, commercial sectors, SPEED academics and students. (c) 7 consultancy projects/ services to Government sectors are conducting during the reporting year.
		2. For the entire project period in 2020-2022, the total number of offered technical
		 (a.1) 11 research seminars to Government sectors, industry, universities, SPEED academics and students. (a.2) 19 technical workshops to Government sectors, industrial/ commercial sectors, SPEED academics and students.

2. (cont'd)	(cont'd)	 (b) Two 1-day regional conferences and one 2-day international conference have been offered to Government sectors, universities, industry, commercial sectors, SPEED academics and students. (c) 7 consultancy projects/ services to Government sectors, industry, and commercial sectors are conducting every year. [Refer to Appendix II (Pages 36 – 85): Fundings to support these activities have already been obtained or provided by the clients, therefore extra external funding is not required.]
3. To work for or with the industry/ community in designing and developing devices/ systems to deal with the corporation/ market needs.	100%	 We plan to conduct 3 – 4 design projects with collaborative effort to design and develop materials/ systems to satisfy the industrial or community needs[#]. During the project period in 2020-2022, there are 14 research/ design projects carrying out with significant collaborative efforts/ contributions from leading scholars/ professionals of other universities/ industry to develop materials/ systems to address industrial or community needs. [Refer to Appendix III (Page 86 – 91): Fundings to support these activities: (i) have already been obtained from external funding sources including RGC, (ii) have been provided by the research collaborators, (iii) have been topping up by CPCE internal funding, or (iii) have been provided by CPCE internal funding. Therefore, extra external funding is not required]

4. To contribute updated knowledge to academic sectors and to enhance our research status by presenting research findings via international conferences/ refereed journals.	100%	 In 2022, research findings planned to be presented via: (a) 8 conference presentations, and (b) 8 refereed journal papers. Research findings have been presented (as refer to Appendix IV): (a) 24 conference presentations, and (b) 56 refereed journal papers. For the entire project period in 2020-2022, the total number of research findings (as refer to Appendix IV): (a) 49 conference presentations, and (b) 125 refereed journal papers. [Refer to Appendix IV (Pages 92 - 109): Due to the COVID-19, the conference papers have
		been presented either in Hong Kong or via the online mode. As all conference presentations are presented via the online mode instead of attending the overseas conference in person, therefore extra funding is not required, and time has been saved 1
5. To underpin teaching with knowledge created from research and development works. Efforts will be made regularly to provide final year projects, improve programme curricula and subject syllabuses, and nurture the research personnel/ students.	100%	 1. Research works are planned to underpin teaching via: (a) provide 16 proposals of final year capstone projects in Building Engineering and Management (BEM), Electrical Engineering (EE) and Mechanical Engineering (ME) programmes[#], (b) make improvement of programme curricula and subject syllabuses[#], (c) supervise 12 Research Assistants/ Undergraduate Degree Students to work in our research projects.
		 (a) propose and then supervise 40 final year capstone projects for the ME, EE, and BEM degree programmes

		1
5. (cont'd)	(cont'd)	 (b) develop an engineering design subject, named SEHS3330 Designing Technical Solutions for the Community, for degree students,
		(c.1) supervise 3 new Research Assistants to work in our external funded research projects, and
		(c.2) supervise 14 Final Year Undergraduate Students to participate in our research projects.
		2 For the entire project period in 2020-2022
		the following research works have been used
		to underpin teaching (as refer to Appendix
		(a) propose and then supervise 81 final year capstone projects for the ME, EE, and BEM degree programmes.
		(b.1) develop 19 new experiments in the subjects (with acquisition of necessary equipment/
		instruments/ computational accessories): Mechanics of materials; Advanced materials for design and technology: Computer aided
		technology for design; UAV control; Robotic arm control; Smart grid; Electric vehicle charging; Hydrogen fuel; BIM
		application,
		(b.2) develop an engineering design subject,
		named SEHS3330 Designing Technical Solutions for the Community, for degree
		(c 1) supervise 10 Research Assistants to work in
		our external funded research projects, and
		(c.2) supervise 41 Final Year Undergraduate
		Students to participate in our research projects.
5. (cont'd)	(cont'd)	[Refer to Appendix V (Pages 110 – 140):
	. ,	(i) Basic concepts of the 19 experiments are
		attached.
		(ii) The Subject Description Form of SEHS3330
		Designing Technical Solutions for the
		(iii) Fundings to support the laboratory/
		computational equipment have already been
		obtained and topped up with the CPCE
		internal funding. Therefore, extra external
		funding is not required]

6. To develop active and competent researchers, in both quantity and quality, such that the critical mass and culture in	100% The successful development of a group of active and competent researchers in PolyU SPEED can be evident by the following achievements in 2020-2022:
research can be formed in PolyU SPEED	(i) Submit 22 research proposals to FDS with 10 proposals being funded (Appendix I).
eventually.	 (ii) Organize 2 regional conferences, 1 international conference, 11 research seminars and 19 technical workshops (Appendix II).
	(iii) Conducting 14 consultancy projects/ services to serve the industry (Appendix II).
	(iv) Conducting 14 design projects with aid of the external collaboration (Appendix III).
	(v) Publish 125 journal papers and make 49 conference presentations (Appendix IV).
	 (vi) Actively providing help to teaching and development of our academic programmes including: (a) provide final year projects; (b) training of research personnel/ students; (c) development of academic subjects and programme curricula (Refer to Appendix V). (vii)Actively conducting collaborative research projects (Appendix VI on Pages 141 – 143). The list consists of some FDS funded research projects which have been started in

* Please refer to the originally approved objectives. If there are changes in objectives, please highlight the changes and quote the date of RGC approval for such changes.
 **Please provide reasons for significant slower rate of progress when compared with the approved

implementation timetable.

[#] Exact number of the specified activity has not been determined in the original implementation plan, therefore it has not been identified as a quantitative milestone.

Attachment to Appendix I - Experimental Setup Developing for Research Projects

To match with the experimental requirements, SPEED has developed the Electric Vehicles and Electrical Engineering Laboratory in Room HHB 801, and Acoustics and Robotics Laboratory in Room HHB UG11. In addition, the Energy Conversion and Utilisation Laboratory (HHB 1306) has been enhanced in facilities.





Attachment to Appendix I - Experimental Setup Developing for Research Projects





Appendix II(a.1) – Research seminars offered by RCADMM in 2020-2022

Date and Time	Location (Attendance)	Theme	Presentation	Presenter
29 April 2020	Online Mode (60)	Roadmap for research development and	The roadmap for the CPCE to becoming university	Prof LEUNG CW
		recent technology in computer vision	A vision-based pedestrian counting system using edge computing technique	Dr James CHAU CP
			Industrial opportunities over pandemic episode	Dr Anthony LAW ^G
29 June 2020	Online Mode (50)	Advanced development in AI, materials, and manufacturing technologies	Development of AI embedded aircraft scheduling decision support system for hangar shop in aircraft maintenance company	Prof Felix CHAN ^G
			3D-printing of bio-inspired composites	Dr Udaya KAHANGAMAGE
			Sound absorption performance of 3D spacer fabrics in composite structures	Dr Zerance NG SP
25 September 2020	Per Online Mode Advanced (55) engineering design, material enhancement and financial	Adaptive control of vehicle yaw stability by using active front steering system and extreme learning machine	Prof WONG PK ^G	
policy for Industry 4.0	policy for Industry 4.0	Incentive policy mechanism and financial subsidies for EV industry in China	Dr Andrew WU Y	
		Strength enhancement of stainless steel 304 through surface mechanical attribution treatment (SMAT)	Dr Maggie LEUNG WY	
			Indirect evaporative cooler design for efficient energy recovery in	Dr Cindy CHEN Y

			air-conditioning systems	
8 January Or 2021	Online Mode (46)	Advanced Design of Robotic and Thermal Systems	Development of a Robotic System for Onsite Concrete Printing	Dr Eva CHAN ^G
			Enhanced Heat Sink Technology using a Bio-inspired Passive Fluttering Mechanism	Dr FU S.C. ^G
			Green Retrofit Strategies for Aged Buildings in Hong Kong	Dr ZHANG H.
19 March 2021	Online Mode (43)	Advanced Materials with	Mesophase Pitch-based Carbon Fibers	Mr Oscar HO ^G
		Superior Properties: Mesophase Pitch.	Production of Graphene Nanocomposites with Semiconductors	Dr Kenneth LO ^G
		Nanocomposites & Metamaterials	Helicoid Acoustic Metamaterials: Theory, Design, and Implementation	Dr Junot LIANG S.J.
18 June 2021Online (48)	Online Mode	ode Enhancement of Material Properties by Plasma Treatment, Nanomaterials & Meta-structures	Application of Plasma in Textiles	Prof KAN C.W. ^G
	(10)		Synthesis of Graphene Nanocomposites in Application of Gas Sensing	Dr Antony LAM K.C.
			Review of Acoustics Materials for Noise Control in Building	Dr Coriolanus LAM C.L.
15 November 2021	Online Mode (30)	Preparation for the Submission of research proposals to FDS in 2022	 Main themes suggested for the coming round of FDS grant application – Dr Zerance NG Discussion on ideas proposed by Members for 2022 submissions 	Dr Edmond LAM Dr Wilson LEUNG Dr Junot LIANG Dr Ricky MAK Dr Zerance NG Dr Andrew WU
4 March 2022	Online Mode (73)	Hong Kong- Advanced Manufacturing	Modelling and Processing of Advanced Composite Materials	Prof Chak-yin TANG

		Technologies for Composite Materials	Manufacturing Technologies for Textile Composites	Dr Zerance NG
8 August 2022	8 August 2022 Online Mode (48)	Advanced Technologies and Materials for Manufacturing Industries	The Advanced Non-destructive Test (NDT) on Building Inspection and the Way Forward	Ir Kenneth PAK
			Job Opportunities and Skill sets requirement for IC Industries	Dr Peter WAI
			Composites with Improved Fire-retardant Property using Micro-size Graphene Oxide Particles	Dr Zerance NG
14 October	Online Mode (36)	Sharing Session	Discussion on ideas proposed by Members for	Dr Wilson LEUNG
2022	Submission	2023 submissions	Dr Chandler ZHOU	
		under FDS		Dr Sheheryar KHAN
18 November 2022	Online Mode (53)	New Trends in Materials Sustainability	The Brand Identity 2.0: Fashion + Tech + Sustainability	Mr Lincoln SZETO
in Texti	in Textile	Fashion Sustainability – Chemical Session	Mr Toiny PANG	
		incustry	3D Printing Auxetic Architectures for	Mr Ronald CHOW
			Hypertrophic Scar Therapy	

^G Invited guest speaker from industry or other universities.

Appendix II(a.2) –	Technical workshops offered by	y RCADMM in 2020-2022

Date and Time	Location (Attendance)	Content	Instructor	Participant
25 September 2020	Online Mode (15)	Computer Workshop ^c – CAD with SOLIDWORKS	Dr Maggie LEUNG WY	All CPCE Students
9 October 2020	Online Mode (15)	Computer Workshop ^c – CFD Application with FLUENT	Dr ZHANG H	CPCE Students and Consultant Engineers
14 October 2020	Online Mode (15)	Computer Workshop ^c – 3-D Printing and Prototyping	Dr Zerance NG SP	CPCE Academic Staff teaching Design
23 November 2020	Online Mode (15)	Computer Workshop ^c – 3-D Printing and Prototyping	Dr Zerance NG SP	CPCE Students studying Design
24 November 2020	Online Mode (15)	Computer Workshop ^c – 3-D Printing and Prototyping	Dr Zerance NG SP	CPCE Students studying Engineering
12 & 14 January 2021	F2F Mode HHB1208 (25)	Fundamental 3D Printing: Start from TinkerCAD	Dr Devil Yip (CPCE)	All CPCE students
19 & 21 January 2021	F2F Mode HHB1208 (25)	Fundamental 3D Printing: Start from TinkerCAD (Re-run)	Dr Devil Yip (CPCE)	All CPCE students
11 June 2021	F2F Mode HHB1208 (25)	Fundamental IoT Workshop	Dr James Chau (SEHS)	CPCE academic Staff and Students studying IT & Engineering
6 August 2021	F2F Mode HHB1208 (25)	Techniques on Measuring Elongation of Elastomers	Mr Anthony Poon ^G (General Manager, Keao Ltd.)	CPCE academic Staff and Students studying Design
13 August 2021	F2F Mode HHB1208 (20)	3D Scanning Workshop	Dr Coriolanus Lam (SEHS)	CPCE academic Staff and Students studying Engineering

20 August 2021	F2F Mode + Online Mode (54)	Workshop on Preparation for FDS Proposal	Dr Zerance Ng (SEHS)	All CPCE academic staff
31 December 2021	F2F Mode HHB1208 (20)	CNC (Computer Numerical Control) Milling Machine Workshop	Dr K.C. Wong & Mr. Max Man (SEHS)	CPCE academic Staff and Students studying Engineering
21 January 2022	HHB-1209 (22)	Fundamental IoT Workshop	Dr James CHAU (SEHS)	CPCE Staff & Students
19 April 2022	Online Mode (14)	The 3D Printing Workshop	Dr Zerance NG (SEHS)	CPCE Staff & Students
28 June 2022	Online Mode (26)	Artificial Intelligence Applications for Industry 4.0	Dr Chandler ZHOU (SEHS)	CPCE Staff & Students
19 July 2022	U301, Industrial Centre (IC), PolyU Main Campus (20)	CAVE (Cave Automatic Virtual Environment)	Dr Jacky CHUNG (Senior Engineering Manager, PolyU)	CPCE Staff & Students
29 July 2022	HHB-1306 (18)	The 3D Scanning Workshop	Dr Zerance NG (SEHS)	CPCE Staff & Students
29 August 2022	HHB-1306 (22)	CNC (Computer Numerical Control) Milling Machine Workshop	Mr Max MAN (SEHS)	CPCE Staff & Students
10 November 2022	HHB-1209 (19)	Preparing a SolidWorks Model for 3D Printing Workshop	Dr Jess CHAN (SEHS)	CPCE Staff & Students

^G Invited guest speaker from industry or other universities.

Appendix II(b.1) – One-day conference offered by RCADMM in 2021 (1st Conference)

******	*****	*****
То	:	All CPCE academic staff and non-academic staff
From	:	Professor Chun Wah Leung, Associate Dean (Research), CPCE
Date	:	11 August 2021 (Wednesday)
Time	:	9:00 am – 6:00 pm
Venue (Onsite)	:	Room UG06, PolyU Hung Hom Bay Campus,
		8 Hung Lok Road, Hung Hom, Kowloon
Zoom Meeting	:	Meeting ID: 993 1838 2177 or join via Link:
(Online)		https://cpce-polyu.zoom.us/j/99318382177?pwd=L0c5RFlGNEID
		SXQxc2V1UldCQTlidz09
Registration	:	https://forms.office.com/r/JhfGzXEqhc
***	*****	

11/8/2021 – Advanced Materials & Industry 4.0 Conference 2021 (AMI 4.0)

Note: The Conference is fully supported by a grant from the Research Grants Council of the *HKSAR*, China (Project No.: UGC/IDS(R)24/19)







Professor MAN, Hau-chung

Chang Yick-chi Chair Professor in Manufacturing Engineering Chair Professor of Materials Engineering Dean of Faculty of Engineering Director of Nessarch Institute for Advanced Manufacturing Director of Newsrity Research Facility in 3D Printing The Hong Kong Polytechnic University

Fabrication of Biodegradable Magnesium Fixation Implants by 3D Printing



Professor WONG, Pak-kin

Professor and Associate Dean (Academic Attair The University of Macau

Automatic Detection of COVID-19 and Multiple Types of Pneumonia from Limited Number of Chest CT Images Based on Advanced Deep Learning Techniques



Professor CHAN, Felix Tung-sun

Professor and Associate Head Department of Industrial and Systems Engineering The Hong Kong Polytechnic University

Optimization and Coordination of Hangar Maintenance Activities for Airlines in MRO Industry



Professor ZHEN, Haisheng Professor Mechanical and Bectrical Engineering College Hainan University

The Fluid Dynamic and Thermal Features of Inverse Diffusion Flames for Synthesis of Nanomaterials



Dr XIONG, Yi

Assistant Professor School of System Design and Intelligent Manufacturing Southern University of Science and Technology

Design for Additive Manufacturing of Continuous Fibre Reinforced Therm Oplastic Composites



Dr LAW, Anthony Kwok-yung Senior Vice President (Research and Development) Raymond Industrial Limited

A Case Study of Cloud Manufacturing involving Precision Electrochemical PECM Processing



Mr LO, Johnson

Co-founder and CEO, KOLB LIFE Limited Chairman — Hong Kong, Chartered Institute of Marketing

Smartglass Mobile Application Solutions: Connecting Customer Satisfaction and Confidence with Production Efficiency for Food & Beverages Manufacturer





Dr CHAN, Jason Kai-yue, MH, JP

Assistant Dean (Innovation and Entrepreneurship) Head of Information Technology College of Professional and Continuing Education The Hong Kong Polytechnic University

The Use of Big Data to Facilitate Industry 4.0

Dr LOH, Anthony Wai-keung

Division Head Division of Science, Engineering and Health Studies School of Polessional Education and Executive Development / College of Polisesional and Control Investig The Hong Kong Polylachtic University

Reinforcement Learning for Traffic Optimization --- A case study of Hong Kong



Dr WONG, Helen Shun-mun

Division Head Division of Business and Hospitality Management School of Professional Education and Executive Development / College of Professional and Continuing Education The Hong Roug Polytechnic University

Opportunities and Challenges of Blockchain Adoption



Dr CHAU, James Chun-pong

Principal Lecturar Division of Science, Engineering and Health Studies School of Professional and Continuing Education The Hong Kong Polytechnic University

Indoor Location System Using WiFi Fingerprint



Dr KAHANGAMAGE, Udaya

Lecturer Division of Science, Engineering and Health Studies School of Professional Education and Executive Development / Callege of Professional and Continuing Education The Hong Kong Polytechnic University

Development and Characterization of 3D-Printed Composite Materials Using PolyJet Technology



Dr NG, Zerance Sun-pui

Associate Division Head Division of Science, Engineering and Health Studies School of Professional Education and Executive Development / College of Professional and Continuing Education The Hong Kong Polytechnic University

Atmospheric Pressure Plasma Treatment for Shear Bond Strength Enhancement in Plant Fiber Reinforced Polymer Composites



Dr LIANG, Junot Shanjun

Lacturer Divelor of Science, Engineering and Health Studies School of Professional Education and Executive Development / Colleage of Professional and Confinuing Education The Hong Kong Polytactnic University

A Modular Design of Acoustic Metasurface

Enquiry: Ms Jenny LI

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Schedule of Advanced Materials & Industry 4.0 Conference 2021 (AMI 4.0 – 11/8/2021)

Location (Attendance)	Theme	Presentation	Presenter
Hybrid mode Advanced Materials	Welcoming Speech	Honourable Ir Dr LO W.K., MH, JP ^G	
Lecture	& Industry	Welcoming Remarks	Prof LEUNG C.W.
theatre UG06, HHB Campus,	4.0	Optimization and Coordination of Hangar Maintenance Activities for Airlines in MRO Industry	Prof Felix CHAN T.S. ^G
PolyU &	The Fluid Dynamic and Thermal Features of Inverse Diffusion Flames for Synthesis of Nanomaterials	Prof ZHEN H.S. ^G	
Zoom		Design for Additive Manufacturing of Continuous Fibre Reinforced Thermoplastic Composites	Dr XIONG Y ^G
(138 Participants		A case study of cloud manufacturing involving precision electrochemical PECM processing	Dr Anthony LAW K.Y. ^G
including on-site and online)	Smartglass Mobile Application Solutions: Connecting Customer Satisfaction and Confidence with Production Efficiency for Food & Beverages Manufacturer	Mr Johnson LO ^G	
		The Use of Big Data to Facilitate Industry 4.0	Dr Jason CHAN K.Y., MH, JP
	Opportunities and Challenges of Blockchain Adoption	Dr Helen WONG S.M.	
		Fabrication of Biodegradable Magnesium Fixation Implants by 3D Printing	Prof MAN H.C. ^G
		Reinforcement Learning for Traffic Optimization – A case study of Hong Kong	Dr Anthony LOH W.K.
		Indoor Location System Using Wi-Fi Fingerprint	Dr James CHAU C.P.
		Development and Characterization of 3D-Printed Composite Materials Using PolyJet Technology	Dr Udaya KAHANGAMAGE
		Atmospheric Pressure Plasma Treatment for Shear Bond Strength Enhancement in Plant Fiber Reinforced Polymer Composites	Dr Zerance NG S.P.
		A Modular Design of Acoustic Metasurface	Dr Junot LIANG S.J.
		Automatic Detection of COVID-19 and Multiple Types of Pneumonia from Limited Number of Chest CT Images Based on Advanced Deep Learning Techniques	Prof WONG P.K. ^G
		Closing Remarks	Prof Warren CHIU C.K.

^G Invited guest speaker from industry or other university

<u>Abstract of Presentation at Advanced Materials & Industry 4.0 Conference 2021 (AMI 4.0 – 11/8/2021)</u>

Optimization and Coordination of Hangar Maintenance Activities for Airlines in MRO Industry – Prof Felix CHAN

Periodic aircraft maintenance overhaul and repair (MRO) ensures the airworthiness and safety in aviation industry. The rapid growth of air transport and the increasing trends of outsourcing MRO create more challenges to MRO industries. Airline companies start to outsource their aircraft heavy MRO operations to independent aircraft maintenance providers to maintain a minimal overall maintenance cost while conforming to the maintenance requirements regulated by the aviation authorities. From the perspective of maintenance service provider, efficiently fulfilling the maintenance requests initiated from different airlines is a critical operation issue. Hangar space and licensed engineers are two significant maintenance resources in carrying out the maintenance planning. To develop a maintenance schedule, the planner needs to specify the service time; respective parking position; and respective licensed engineers for each aircraft. The overall objective of this research project is to develop a maintenance planning decision support methodology aims to deliver an integrated solution from the Operations Research's aspect. While modelling the optimization problem, the impact of aircraft's irregular shapes; and the effects of blocking in assigning parking position shall be taken into considerations. This keynote speech introduces the methodology of problem modelling in two stages, including the modelling of irregular aircraft shapes to utilize the hangar space; and movement blocking by parking position assignment. Moreover, how the iterative amendments of mathematical models manage to align with the realistic operations by practitioners will also be discussed afterwards.

The Use of Big Data to Facilitate Industry 4.0 – Dr Jason CHAN, MH, JP

In business environment, big data analysis is the use of advanced computing technologies on huge data sets to discover valuable correlations, patterns, trends, and preferences so that companies can make better decisions. How is big data analytics used in Industry 4.0? In Industry 4.0, big data analysis plays a role in some areas, especially in smart factories, where sensor data from production machinery is analyzed to provide self-service systems, predict maintenance, reduce downtime, automate production management, improve warehouse processes, eliminate bottleneck and so on.

If there is no big data, what will happen to Industry 4.0? Industry 4.0 is based on life big data, and big data continues to grow based on these data. The interconnection among many systems and the ability to analyze large amounts of data make it possible for the existence of intelligent machines that can make wise decisions without any human intervention.

What is the biggest challenge on the use of big data to facilitate Industry 4.0? How to extract value from manufacturing big data in order to achieve merging quality and production data to improve production quality, empower customers, predict demand, improve security, achieve load optimization, enhance supply chain management and non-conformity analysis?

Indoor Location System Using Wi-Fi Fingerprint – Dr James CHAU

In this research, a novel Indoor location system is developed. The system aims at providing accurate positions of the users who wear the location devices without the installation of any extra location transmitter or receivers in the infrastructure. This system employs the WiFi signals or

WiFi fingerprints inside buildings by collecting their Received Signal Strength Indicator (RSSI) which become the signatures of the indoor positions. To implement the indoor location system, high quality indoor maps of buildings are first produced in which every single position in the maps can be represented by its longitude and latitude. In addition, the pathways inside the buildings are clearly defined in order to prevent the drifting effect during the location process. Then, some specific locations in the maps will be identified for the collection of WiFi fingerprints using smart devices. The collected WiFi fingerprint and maps are stored in a database. During the location process, when the database receives the query from a location device, the collected WiFi RSSI will be sent to the system and it compares the query signals with the WiFi fingerprints stored using the crowdsourcing based radio map anomalous event detection method for determining the position of the device. In order to evaluate the system, a positioning software is developed and is transferred to a tracking device M5StickC for equipping it with the capability to scan the WiFi RSSI and carry out the location function. Experiments show that the system can achieve an accuracy of 5m in determining the indoor locations. In addition, the tracking function can be easily achieved by accompanying the locations with their corresponding time stamps.

Development and Characterization of 3D-Printed Composite Materials Using PolyJet Technology – Dr Udaya KAHANGAMAGE

Multi-material 3D-printing has created new possibilities of one-step production of 3D-printed composite materials. It enables the creation of complex geometric forms which are generally limited in traditional manufacturing processes used for composite materials. However, multi-material 3D-printing is still in its infancy compared with the single material printing technologies. The PolyJet technology by Stratasys is currently the standout multi-material printing technology because of its ability of printing high-resolution parts and wide range of material availability. In this research study a method of composite material printing by combining flexible rubber like and rigid material is investigated. Two proprietary base materials, Agilus30 (flexible rubber like) and VeroPureWhite (rigid) are used to 3D-print material samples mimicking soft and hard phases normally present in traditional composite materials. Material samples with consecutive layers of hard and soft materials in horizontal and vertical directions with different orientations were printed and tested. The volume fractions of soft and hard materials in all material designs were maintained at nearly the same. Tensile test results show that the interface of the two materials is strong enough to support the stretching without failure at the interface layers. The results also show that the tensile performance of each material design is different. The results show the potential of developing an optimum composite material design with further studies.

A case study of cloud manufacturing involving precision electrochemical PECM processing – Dr Anthony LAW

With the aid of IOT infrastructure and standardization of machining protocol, the concept of cloud manufacturing has accelerated to realize particularly during this pandemic period where human transportations were restricted. Cloud manufacturing would be an ideal operation manner to fully utilize all of the available hardware in the industries without geographic limitation and even further enhanced the output performance of all linked machinery to their limit with real time monitoring and optimization. With the aid of Ai and big data, the best combination of acceptable tolerances from different machine could be matched for ultimate efficiency and effectiveness. In this study a trial demonstration of cloud manufacturing was conducted upon a multiple PECM process with its associated QC procedure. It involved the real time calibration and process control where could be taken place remotely with the reference of ongoing quality control results.

A Modular Design of Acoustic Metasurface – Dr Junot LIANG

The recent decades witnessed the intensive development of acoustic metamaterials and metasurfaces, introducing extraordinary characteristics with unique effective parameters.

Metasurfaces can manipulate the wavefront at wish while their thickness is much smaller than traditional lenses. The geometry of the unit cells is essential for metasurfaces' properties and functionalities. Based on flexible and broadband sub-wavelength unit cells, metasurfaces can be more reconfigurable for practical utilizations. In this work, a modular acoustic metasurface shows its broadband property and multifunctional capabilities. A newly designed helical-structured unit cell shows excellent energy transmission efficiency in more than 1/3 octaves. The high energy transmission is accompanied by linear phase shift along with the frequency. The metasurface composed of the helical-structured unit cells maintains a linear phase gradient in the related frequency range, inserting nearly a uniform refractive angle over the spectrum for the normal incidence. The rearrangement of the unit cells can double or triple the current phase gradient, resulting in new applications. A broadband reconfigurable acoustic axicon demonstrates the performance of such modular metasurfaces. The same unit cells but the different arrangements can be a Bessel beam launcher or a beam splitter. This work simplifies the strategy to design multifunctional metasurfaces.

Smartglass Mobile Application Solutions: Connecting Customer Satisfaction and Confidence with Production Efficiency for Food & Beverages Manufacturer – Mr Johnson LO

Robotic production line is not the only technology that could be found and used in the food manufacturing industry. Involving smart glass technology with UX has driven smart phone applications could also accelerate food safety monitoring, auditing, and customer satisfaction for the industry players.

The use of the technology to keep track of the entire supply chain was a suitable solution as it was extremely difficult for large manufacturers and retailers with complex things to monitor. A traditional CCTV would have limitations due to their setting and viewing angle. The smart glass itself, however, is viewing and hearing what the person who are wearing. That person could be an auditor, chef, manager or even a customer throughout the network.

Technology gadgets like smart glass is not about fashion, but a multi-functional device that could help training, communicating, and connecting factory workers, office management, logistic team as well as end customer together. KOLB LIFE Limited, a Hong Kong food manufacturing and retailing company with ISO 22000 and HACCP certification located in Kennedy Town would tell you more about how they build their future with this smart glass mobile application solution to enhance customer satisfaction and confidence as well as food safety, quality and wastage control for their management.

Reinforcement Learning for Traffic Optimization – A case study of Hong Kong – Dr Anthony LOH

In recent years, many researchers start to develop an intelligent traffic light system to replace the traditional pre-defined fixed-cycle traffic light systems. In this study, we tried to find the optimal traffic light system algorithm by using the reinforcement learning algorithm. By using Q-Learning, we apply reinforcement learning techniques to traffic light policies intending to increase traffic flow through intersections. We set up a most common road intersection for simulation and also

proposed five algorithms for simulation. Various policies including fixed cycles, longest queue first (LQF), and a reinforcement learning technique Q-learning are compared and evaluated on various types of intersections as well as networks of traffic lights. We further using an open-source emission factor model MONTIRA to qualify the percentage of reduction when compared with traditional pre-defined fixed-cycle traffic light systems. Our results showed that pre-defined fixed-cycle traffic light systems had the worst performance in terms of average waiting time and pollutant emission. Further experiment with more complex simulations to resemble real-world situations is needed.

Fabrication of Biodegradable Magnesium Fixation Implants by 3D Printing – Prof MAN H.C.

Bones plates are a common type of orthopedic implants used in bone fracture surgery. They function as internal fixation of the fractured parts and provide mechanical support during the bone reunion period, which usually lasts for about three months. After the bone healing period bone plates become a nuisance as they would elicit adverse effects like osteoporosis due to stress shielding. Bone plates should ideally disappear via biodegradation in vivo after bone healing, otherwise a second surgery might be needed for removal. Among the biodegradable metallic materials magnesium alloys have been regarded as a desirable candidate by virtue of a Young's modulus close to that of human cortical bone. On the other hand, the corrosion rate of magnesium alloys in body fluids is too high for bone plate applications. However, this hurdle could be overcome by an appropriate selection of alloy composition and processing route to obtain a favorable microstructure. In this connection, 3D printing is an ideal process because of the resulting fine microstructure that could slow down corrosion and because of its tailor-made capability for individual patients. The effect of 3D printing parameters on the microstructure and corrosion rate of magnesium bone plates will be discussed in this presentation.

Atmospheric Pressure Plasma Treatment for Shear Bond Strength Enhancement in Plant Fiber Reinforced Polymer Composites – Dr Zerance NG

Sustainable development is always a global concern and it can be supported by green materials. The uses of plant fibers to replace inorganic fibers as reinforcement in composites are preferred for engineering applications. However, the interfacial bonding between the hydrophilic plant fiber and hydrophobic resin in composites is relatively weak. This study aims to explore the effectiveness of utilizing atmospheric plasma treatment to enhance the bond strength of flax/epoxy composites. Air plasma and argon plasma treatments applied were adopted separately for the flax fabrics at two different speeds (21.4 mm/s and 85.7 mm/s). Composite plates using plasma-treated flax fabrics and untreated fabrics at 00 were made by using the vacuum infusion technique. The surface characteristics of plasma-treated and untreated fiber were examined by the Scanning Electron Microscope (SEM) while the interfacial bond strengths of composite materials were evaluated in terms of interlaminar shear strengths by the Short Beam Shear (SBS) tests. The results of SBS tests showed that the average interlaminar shear strength of low-speed argon plasma-treated flax/epoxy composite samples was improved by 14.2% and 11.8% when compared that of untreated and dry air plasma-treated composites. The increase in fiber/resin bond strength was also revealed by the SEM micrographs as the pull-out of plasma-treated flax fiber from the epoxy material was reduced.

Opportunities and Challenges of Blockchain Adoption – Dr Helen WONG

Currently, we are in the Industry 4.0 era that supports digital production and enables data collection to facilitate decision making. Technologies such as artificial intelligence (AI), 3D printing, 5G, virtual reality, and blockchain have been adopted in different industries in the Industry 4.0 era. On the other hand, the Hong Kong business market is facing a severe situation under the COVID-19 pandemic. It is reported that small and medium-sized enterprises (SMEs) eager to adapt to the market disruption for recovery. One possible measure to foster business recovery is to accelerate the use of digital operations and enhance information security. Among all technologies, blockchain (BCT) is one of the top trends; however, its adoption rate is quite low. It can be a difficult and very time-consuming task to introduce innovative technology to an enterprise. By conducting semi-structured interviews with senior management of the Hong Kong SMEs, this study aims to understand the challenges and perceived opportunities of BCT adoption from the Hong Kong SMEs' point of view such that it can be promoted to the enterprises effectively. We find that perceived benefits, perceived complexity, perceived risks, resources availability, learning capability, government support and economic situation are the major challenges of BCT adoption. Besides, the food safety monitoring and authenticity traceability, digitalization of the operations and paperwork elimination, and smart contract are the potential opportunities of the BCT adoption.

Automatic Detection of COVID-19 and Multiple Types of Pneumonia from Limited Number of Chest CT Images Based on Advanced Deep Learning Techniques – Prof WONG P.K.

precise identification of COVID-19 Rapid and pneumonia and differentiating it from non-COVID-19 viral pneumonia, bacterial pneumonia, mycoplasma pneumonia and healthy lung on chest computed tomography (CT) images play a crucial role in timely quarantine and medical treatment. However, manual identification subjects to potential misinterpretations and time-consumption issues due to the visual similarities of pneumonia lesions exist. In this study, Attention Network (PANet), which a Pneumonia can capture vital multi-scale information and automatically pay attention to discriminative information for better classifying multiple types of pneumonia, is proposed. To overcome the scarcity of labeled training data and further improve the diagnostic performance of the PANet, a naïve semi-supervised deep learning framework that can utilize limited labeled data and large-scale unlabeled data is also proposed to provide auxiliary training. Experimental results show that the proposed PANet can achieve a per-image accuracy of 96.18% and sensitivity of 93.61%. All of these promising results indicate that the proposed diagnostic framework has great potential to assist physicians and radiologists in the decision-making process.

Design for Additive Manufacturing of Continuous Fibre Reinforced Thermoplastic Composites – Dr XIONG Y.

In the past decade, the emerging of additive manufacturing (AM) has revolutionized the fabrication process of continuous fiber reinforced polymer (CFRP) composites with its outstanding ability to create products that are complex in material, structure, and function. However, existing studies mostly focus on the manufacturing process without paying sufficient attention to exploring new design opportunities enabled by CFRP-AM. In this talk, I will introduce the design concept for additive manufacturing of continuous fiber reinforced thermoplastic (CFRTP) composites, aiming to improve existing products' performance and foster product innovations for future needs. More specifically, the existing CFRTP-AM techniques will

be reviewed from the perspective of functional requirements. Design opportunities within the material, process, and structure domains will also be discussed together with a design case on composite cellular structures.

The Fluid Dynamic and Thermal Features of Inverse Diffusion Flames for Synthesis of Nanomaterials – Prof ZHEN H.S.

Flame synthesis of nanomaterials such as nanotubes or nanofibers typically relies on laminar normal diffusion flame (NDF). Different from NDF, laminar inverse diffusion flame (IDF) has many distinctive features in terms of flow field and flame structures, which are favorable for studies of soot formation process. As the formation of soot and nanomaterial are just two sides of a coin, IDF is worth to be studied in the field of nanomaterial synthesis. In the literature, only a few studies have been devoted to flame synthesis using IDF. This paper, presents a thorough review of the laboratory IDFs, introducing its history, its current development and its flow and structure characteristics. This review copes with a number of issues like IDF burner design, features of burner geometry, analysis of flow dynamics, flame structure and characters of thermal field. After this, the usage of IDF for detailed studies of soot formation and evolution process is fully recognized. Then, the adoption of IDF for synthesis of nanotubes or nanofibers are foreseen. This review work provides a reference for selection and investigation into IDF-synthesized nanomaterials in the future.

Photos Taken at Advanced Materials & Industry 4.0 Conference 2021 (11/8/2021)





Dr Anthony Loh's Presentation

Dr Jack Lo and The Honorable Guest: Prof HC Man





Dr Helen Wong Presenting "Supply Chain"

Closing Remarks by Prof Warren Chiu



Organizers and The Honorable Guests

Appendix II(b.2) – One-day conference offered by RCADMM in 2021 (2nd Conference)

7/1/2022 – Conference on Advanced Materials and Processing Technologies (AMPT)

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То	:	All Staff
From	:	Professor Chun Wah Leung, Associate Dean (Research), CPCE PolyU
Date	:	7 January 2022 (Friday)
Time	:	9:30 am – 5:30 pm
Venue (Onsite)	:	Room UG06, PolyU Hung Hom Bay Campus,
		8 Hung Lok Road, Hung Hom, Kowloon
Zoom Meeting	:	Meeting ID: 993 1838 2177 or join via Link:
(Online)		https://cpce-polyu.zoom.us/j/99318382177?pwd=
		L0c5RFIGNEIDSXQxc2V1UldCQTlidz09
Registration	:	https://forms.office.com/r/JhfGzXEqhc
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Charles I BURNIN, Minin 1997 (1915–1916) Emeritus Professor Department of Architecture and Civil Engineering City University of Hong Kong Presentation Topic Nanomechanics of Carbon Nanotubes and New Stainless-Stee

CALL IG, Standy Subb Associate Director of State Key Laboratory of Ultra-precision Machining Technology Department of Industrial and Systems Engineering Polyu

re Evolution and Machinability of Electropulsing Treated Titanium Allows in Ultra-precision Machining



er Alen, sontagy (king, shisopp) Lecturer Division of Science, Engineering and Health Studies PolyU CPCE Preventation Topic Synthesis of Grephene Nanofiber in Application of Gas Senting

Dr VVAB. Sconnel Lecturer Division of Science, Engineering and Health Studies PolyU CPCE of Sputter-Deposited CrSIN Thin Films





Pres

UP Nd., Sheng J Gron Assistant Professor Department of Industrial and Systems Engineering PolyU entation Topic: Manufacturing Advanced Materials for Electroc rgy Storage Applications

CDS

Cradin, America Associate Professor Department of Mechanical Engineering PolyU Presentation Topic: Mechanics Underlying the Structure-property Re Unveiled from Natural Biomaterials

Le CH US, CHARINER WEI FEIL Lecturer Division of Science, Engineering and Health Studies PolyU CPCE tation Topic: The employment of advance materials and processing technique on the UAV/UAV component manufacturing



Presentation Topic: Sensing Technology of Large Deformation and Impact Force on 3D Human-machine Interface

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Schedule of Conference on Advanced Materials and Processing Technologies (AMPT, 7/1/2022)

Location (Attendance)	Theme	Presentation	Presenter
Hybrid mode Lecture theatre UG06, HHB Campus, PolyU And via: Zoom (121 Participants including on-site and online)	Conference on Advanced Materials and Processing Technologies	Welcoming Remarks	Prof Peter YUEN P.M.
		Opening Speech	Prof Christopher CHAO Y.H. ^G
		Size Effects in Multi-scaled Engineering Mechanics and Manufacturing	Prof FU M.W. ^G
		Nano Mechanics of Carbon Nanotubes and New Stainless-Steel Materials	Prof Andrew LEUNG Y.T. ^G
		Atomic-scale Understanding of High-performance Engineering Metallic Materials Fabricated by Advanced Processing Technologies	Dr YANG X.S. ^G
		Ultra-precision Machining of Functional Freeform and Structured Surfaces	Prof Benny CHEUNG C.F. ^G
		Mechanics Underlying the Structure-property Relations Unveiled from Natural Biomaterials	Dr YAO H.M. ^G
		Effect of Electro-pulsing Treatment on Machinability of Ti6Al4V Alloys in Ultra- precision Diamond Turning	Prof Sandy TO S. ^G
		Structural and Mechanical Characterization of Sputter-Deposited CrSiN Thin Films	Dr VYAS A.
		Synthesis of Graphene Nanofiber in Application of Gas Sensing	Dr Antony LAM K.C.
		Manufacturing Advanced Materials for Electrochemical Energy Storage Applications	Dr XU Z.L. ^G
		Sensing Technology of Large Deformation and Impact Force on 3D Flexible Human machine Interface	Dr ZHU B.
		The Employment of Advance Materials and Processing Technique on the UAV/UAV Component Manufacturing	Dr Chandler ZHOU W.F.
		Closing Remarks	Prof Keith CHAN K.C. ^G

^G Invited guest speaker from industry or other university
<u>Abstract of Presentation at Conference on Advanced Materials and Processing Technologies</u> (AMPT, 7/1/2022)

Ultra-precision Machining of Functional Freeform and Structured Surfaces – Prof Benny Cheung

Functional freeform and structured surfaces possess non-rotational symmetry while different dimensional scales of structured patterns are embedded in large-scale flat or curved substrates. They are widely used in advanced applications such as compound eye lenses for 3D imaging, lobster eye focusing optical systems for X-ray detection, and bionic surfaces with self-cleaning ability and wettability, which are indispensable to maximize the performance of high value-added products. Due to the geometrical complexity of these surfaces, they have to be fabricated by more than one type of ultra-precision machining technology with high precision in terms of sub-micrometre form accuracy and nanometric surface finishing so as to ensure the functionality and performance of the workpiece being machined. In this presentation, the state-of-the-art research on ultra-precision machining of freeform and structured surfaces for different functional applications is discussed through some case studies and industrial applications. The presentation attempts to shed some light on the future development of ultra-precision machining of functional freeform and structured surfaces which will help spur the growth in the functional application and manufacturing of these surfaces.

Size Effects in Multi-scaled Engineering Mechanics and Manufacturing – Prof Fu M.W.

Size effect (SE) exists in many concerned domains due to the value change of size effect factors. Size effect factors are defined as the influencing parameters of the materials, structures or systems to be concerned whose value change would lead to different SE manifestations. In multi-scaled materials processing and manufacturing, including macro-, meso- and micro-scaled ones studied in this paper, SEs occur in these size scales and would induce different process behaviors, phenomena, and performances in different scales. The SEs can further result in the scatters of process behaviors, phenomena, and the quality and property of the fabricated different scaled parts and components. By using multi-scaled machining and deformation-based manufacturing as the case study processes of materials processing and manufacturing, the above-mentioned SEs and their induced manifestations are reviewed and analyzed. The current research status and the future focuses are articulated and discussed. Some critical issues to be addressed and unknowns to be understood are highlighted. The talk aims at presenting a panorama of SEs, their impacts and bottleneck issues in multi-scaled materials processing and manufacturing for making multi-scaled parts and components and how to address them to ensure the efficient realization of multi-scaled materials processing and manufacturing.

Synthesis of Graphene Nanofiber in Application of Gas Sensing – Dr Antony Lam

One dimensional metal oxide nanofibers are promising material in gas sensing due to high surface area and porosity, which is most efficient in transducing gaseous interactions to electrical signal by directional carrier transport. Semi-conductor such as Tin dioxide (SnO₂) is non-toxic, low cost, easily accessible with wide band-gap energy, have been reported to have high sensitivity and fast response to gas sensing due to the active sites of oxygen vacancies. However, the semi-conductor nanofiber gas sensors are usually operating at high temperature and only few efforts were reported to lower the operating temperature. As a frontier material, graphene is a highly interesting research topic in material science as applications of composites, solar cell and gas sensor due to its zero band-gap energy which demonstrates superior electrical conductance. Hence the composites of graphene and semi-conductor are promising heterostructures to lower the operating temperature with high sensitivity of gas sensing. This seminar will discuss the method used in forming graphene semi-conductor nanofiber and applications in room temperature gas sensing.

Nano-mechanics of Carbon Nanotubes and New Stainless-Steel Materials – Prof Andrew Leung

Nano-mechanics is revisited using carbon nanotubes as examples. The talk includes (1) Molecular dynamics simulations on buckling and failure of multi-walled carbon nanotubes (MWCNTs); (2) Continuum shell model for mechanical analysis of MWCNTs; (3) atomistic cellular automata algorithm and atomistic FEM; and (4) Multi-layered Graphene Sheet. Finally, the non-local cracking in layered stainless steel with nanostructured interface is discussed and new stainless-steel materials are discovered.

Structural and Mechanical Characterization of Sputter-Deposited CrSiN Thin Films – Dr Anand Vyas

Chromium Nitride (CrN) films are widely used in industry for cutting tools. Although the application of CrN film is successful, its further demand for higher hardness is the driving force for the development of these films. The selection of technique for deposition of these films affects the structure and properties strongly. CrN-based films with incorporation of high concentration of Si, when deposited by cathodic arc, pulsed magnetron and arc ion plating technique increases hardness of the film only when deposited at high temperature of 500 $^{\circ}C$ – 600 $^{\circ}C$ with high ion current density, to achieve nanocrystalline structure. Amongst many deposition techniques, Closed Field Unbalanced Magnetron Sputtering (CFUBMS) has made significant impact in areas where coatings when deposited at lower temperature of only 200 °C, with controlled deposition parameters can have desired properties. In this study, pure CrN and ternary CrSiN films doped with various Si contents ranging from 0.8 at% - 7.1 at%, were prepared onto Si(100) substrates by CFUMBS technique and were investigated. The crystal structure, chemical states, surface roughness, microstructure and mechanical properties of the films were characterized by X-ray diffraction, X-ray photoelectron spectroscopy (XPS), transmission electron microscopy (TEM), and nano-indentation measurements. XRD results showed a prominent CrN (111) reflection in both CrN and CrSiN films. Results demonstrate that CrSiN films formed a solid solution and doping of Si atoms affects the crystallization of the films. XPS results provided the bonding status. In Cr2p3/2, the Cr-N bond is confirmed whereas, in N1s, Si₃N₄ bond and Cr-N bond structure's existence in the film is confirmed. A correlation between microstructure and mechanical properties exists. With amorphous/nanocrystalline domains in the films, the hardness is found to increase by 16% when compared with pure CrN film.

Manufacturing Advanced Materials for Electrochemical Energy Storage Applications – Dr Xu Z.L.

The combined effects of rapid growth in population and global energy demand as well as geopolitical and climate change issues motivate a policy change to renewable energy resources. Energy storage systems take the privilege to bridge the intermittent green energy resources and

the electric devices. Rechargeable batteries have become indispensable in our modern life since its successful launch in 1990s. Conventional lithium-ion batteries with graphite anodes and transition metal oxide cathodes are approaching their theoretical limit in energy densities (about 250 Wh/kg), which cannot meet the emerging and demanding applications, *i.e.*, electric vehicles and smart grids. Exploring new electrochemistry and design/manufacturing advanced electrode materials for new battery systems with higher energy densities and lower cost become necessary and imperative. The electrochemical performance is tightly related to the micro- and nanostructures of electrode materials, which further rely on the manufacturing technologies. In this talk, I would like to introduce the electrospinning technique to produce various nanofibers applied in state-of-the-art electrochemical energy storage systems, including lithium-ion battery, lithium -sulfur batteries, sodium-ion battery and supercapacitors. The correlations among the electrospinning parameters, microstructures of nanofibers and the electrochemical performance will also be covered in the talk as explained our rich research experiences. In addition, this talk will also introduce cutting-edge characterization techniques, such as in-situ transmission electron microscopy, to unveil the working mechanisms of fibrous electrodes in working batteries under high spatial and temporal resolutions. Finally, an overview and outlook of other representative techniques to fabricate advanced energy storage materials will be given.

Atomic-scale understanding of high-performance engineering metallic materials fabricated by advanced processing technologies – Dr Yang X.S.

A variety of key fields (including aerospace, advanced manufacturing, new energy, deep-sea technology, and transportation, etc.) have created an urgent need for the design, fabrication, and service evaluation of new high-performance engineering metallic materials. Strength and ductility are the most crucial properties for these metallic components, but there are naturally exclusive. For example, uniformly reducing the grain size to the nanometer scale has been well recognized to substantially improve the strength of metals. However, the ductility of the strengthened homogeneous nanograined metals will be inevitably sacrificed to a significant extent. In recent years, a new class of nanomaterials called heterogeneous nanostructured materials possessing the soft and hard mixed regions have been proposed and designed to unique architectures, e.g. gradient phases/composition/grain/twin/lamellar, hierarchical structural grains/twins, and crystalline-amorphous nanocomposites, etc., from the nanometer scale to the micrometer scale. Heterogeneous structures can harvest the co-deformation cooperative effects between different domains, thus achieving the superior high strength-ductility combination. In this presentation, we will introduce some typical heterogeneous nanostructured materials, e.g. phase-transforming nanostructured steels, nanotwinned and gradient nanotwinned metals, as well as nanostructured etc., crystalline-amorphous metals, covering the advanced processing technologies, microstructural evolution, mechanical properties, and underlying plastic deformation mechanisms investigated by atomic-scale characterizations and simulations.

Mechanics underlying the structure-property relations unveiled from natural biomaterials – Dr Yao H.M.

Through millions of years' evolution, biological materials have developed delicate structures with exceptional mechanical properties to tackle the potential attacks from the environment. Unveiling the structure-property relations concealed in biological materials with mechanics theory and applying them to guide the design and manufacturing of engineering materials is now an emerging trend. In this talk, some important structure-property relations revealed recently from the

biological materials are illustrated. The structural attributes to be covered include size, heterogeneity, shape and topology, chirality and hierarchy, and our attentions are mainly focused on the mechanical properties like strength, toughness, energy dissipation, adhesion and so on. All these structure-property relations as revealed not only prove the importance of structure in shaping the unique mechanical behaviors of biomaterials, but also imply a great promise of application in the design and manufacturing of novel biomimetic materials.

The employment of advance materials and processing technique on the UAV/UAV component manufacturing – Dr Chandler ZHOU W.F.

Nowadays, the innovation in the material technology and the processing technique faster than ever. As new material and processing technique can sometime create breakthrough in the unmanned aerial vehicle (UAV) performance in many aspects. In the UAV industry, the intensity to apply and adapt new material as well as advance processing technique has never stop. For example, the UAV industry has already moved from the gasoline age to electrical age due to the improvement of Li-po battery and small size electronic in recent year. Among the off the shelf materials, those who are light by strong are especially eye catching in the UAV industry since the weight is always a critical parameter of an UAV. This presentation includes two cases that are trying to make light weight UAV or UAV components by using advance material and processing technique. An extreme light weight and small flapping wing UAV will be first introduced, which is make up of flexible materials and small scale electronic. Then the procedure of a handmake wooden air foil of a fixed wing UAV using the technique of hot wiring and carbon fibre moulding will be presented.

Sensing Technology of Large Deformation and Impact Force on 3D Flexible Human-machine Interface – Dr Zhu B.

The world has entered a time of intelligence, in which smart products, such AI, VR, robotics, etc., are in rapid development. The technologies between man-machine interfaces have become critical, and one of the challenging demand is the sensing technology, especially on 3D surface of flexible target under high-speed interaction. In the field of transportation, construction, rescue, sports, and ballistics, high-speed impact with great amount of energy is involved. This presentation introduces an innovative technology for measuring large deformation and impulsive force on soft bodies at medium- to high-strain rate. Based on a multi-phase conductive composite fabric, which has characteristics of high-sensitivity, low-cost, biocompatibility and environment-friendliness. Experimental characterization and theoretical analysis were conducted to optimize and model the electro-mechanical behavior of the composite. Relevant prototypes of sensors, matrices, and systems were designed and fabricated, and trial used in particular fields of application. Value information which has not been acquired by other conventional technologies was found. The technology demonstrates a great potential in smart products for human-machine interaction. Moreover, it provides opportunities to investigate and understand material's behavior in fundamental research.

Photos Taken at Conference on Advanced Materials and Processing Technologies (7/1/2022)





Prof Andrew Leung's Presentation



Prof Benny Cheung's Presentation



Organizer and The Honorable Guest



Chandler Presenting The Making of UAV



Dr Simon Leung, Prof CW Leung, Prof Keith Chan and Dr Zerance Ng at Completion of The Conference of AMPT

<u>Appendix II (b.3) - Two-day Conference Offered by RCADMM in 2022 (3rd Conference)</u> <u>6-7/10/2022 – International Conference on Advances in Design,</u> <u>Materials and Manufacturing Technologies 2022 (ICADMMT 2022)</u>

*********	***************************************	***********		
To:	All Staff			
From:	Professor Chun Wah Leung, Associate Dean	(Research), CPCE PolyU		
Date:	6 October 2022 (Thursday)	7 October 2022 (Friday)		
Time:	9:30 am – 5:00 pm	9:30 am – 1:00 pm		
Venue	Silverbox Ballroom, Hotel ICON, 17	Room UG06, PolyU Hung Hom Bay		
(Onsite):	Science Museum Road, Tsim Sha Tsui,	Campus, 8 Hung Lok Road, Hung Hom,		
	Kowloon	Kowloon		
Zoom	https://cpce-polyu.zoom.us/j/92692500095	https://cpce-polyu.zoom.us/j/95439364183		
Meeting:		https://cpce-polyu.zoom.us/j/95241277911		
(Online)		https://cpce-polyu.zoom.us/j/99683605863		
Registration: https://forms.office.com/r/6VXuAxhphB				

Note: The project is partially supported by a grant from the Research Grants Council of the Hong Kong Special Administrative Region, China (Project No.: UGC/IDS (24)/19).





Hesearch Assistant Protessor of Department of ndustrial and Systems Engineering, The Hong Korg Poylectric University Presentation Topic: Machine Learning-Based Super-resolution Algorithm and its Application in Medical Images

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2022

ICADMMT

<u>Schedule of International Conference on Advances in Design, Materials and Manufacturing</u> <u>Technologies 2022 (ICADMMT 2022, 6/10/2022)</u>

Location	Theme	Presentation	Presenter
(Attendance)			
Hybrid mode	International Conference on	Opening Speech	Ir Dr Hon LO W.K. ^G
Silverbox Ballroom, Hotel ICON,	Advances in Design, Materials	Welcoming Remarks	Prof Peter YUEN P.M.
Kowloon	and	FlexiDesign®: Public Design for	Prof Michael SIU
	Manufacturing	Sustainable Urban Life	K.W. ^G
And via:	Technologies	3D Printing Materials with	Prof KAN C.W. ^G
Zoom		Antimicrobial Effect	
		Design of Large-Sized Metallic	Prof YANG Y. ^G
(120 Participants		Nanosheets for Manufacturing of	
including on-site		Small-Scale Structures and	
and online)		Devices	
		Silk Revitalization for Advanced	Dr FEI B. ^G
		Applications	
		Interstitial Oxygen in Additive	Dr CHEN Z. ^G
		Manufactured Titanium Alloys	
		Modeling and Trajectory	Dr DUAN M. ^G
		Optimization in Additive	
		Manufacturing of	
		Continuous-fiber-reinforced	
		Materials	
		The Design of Copper	Dr LIU Y. ^G
		Microstructure for the Fast	
		Killing of Virus	
		Machine Learning-based	Dr Eric TENG L.
		Super-resolution Algorithm and	G
		its	
		Application in Medical Images	
		Development of a Novel	Dr WANG C. ^G
		Magnetic Field-assisted Batch	
		Superfinishing Method for	
		Polishing of Freeform Surfaces	
		Electrospinning Nanofibers for	Dr XU Z. ^G
		High Performance Rechargeable	
		Batteries	
		Numerical Investigation of the	Dr ZHONG S. ^G
		Generalized Impedance	
		Abaamtian Matariala in	
		Ausorption Materials in	
		Aerodynamic Flows:	
		Clasing Deresta	Dr. Zerrere NO
		Closing Remarks	S P

*Invited guest speaker from industry or other university

Abstract of Presentation at International Conference on Advances in Design, Materials and Manufacturing Technologies 2022 (ICADMMT 2022, 6/10/2022)

FlexiDesign®: Public Design for Sustainable Urban Life - Prof Michael SIU K.W.

FlexiDesign® was advocated in 2005. It has been developed for the promotion of a flexible design approach to meet the rapid and frequent changing everyday life. It takes an all-round approach to consider needs and preferences of users from physiological, social, cultural, psychological, and ideological perspectives. While the design approach focuses on a balance of theoretical breakthrough and technological application, the expected outcomes of the design are to enhance an inclusive and sustainable life for all. Regarding public design for urban life in particular, this presentation briefly introduces the concept of FlexiDesign®. By using recent designs of street furniture and public facilities, such as street bollard, waste and recycling bins, the model of PIM (policy, implementation, management) of public design will be presented.

3D Printing Materials with Antimicrobial Effect - Prof KAN C.W.

In this paper, the development of 3D printing materials with antimicrobial effect with application will be presented. The advantages of the 3D printing materials will also be reviewed when compared with conventional materials. In addition, some field study results will be discussed. Through this paper, it is expected that exploration of novel antimicrobial treatment would be developed to tackle health and safety issue related to daily use products.

Design of Large-Sized Metallic Nanosheets for Manufacturing of Small-Scale Structures and Devices - Prof YANG Y.

Ultrathin materials, such as 2D materials (e.g., Graphene, MoS2), thin films and etc, have attracted a great deal of research interest worldwide because of their remarkable properties and promising applications, such as in flexible electronics, wearable devices, conformable body sensors and soft robotics. Over the past years, people have been trying to expand the family of ultrathin materials in order to further improve the performance of these soft structures, devices and machinery. In this talk, I am going to present our recent research in the fabrication of freestanding ultrathin metals/ceramics through the method of polymer surface buckling enabled exfoliation (PSBEE) we recently developed. Unlike the prior works that were limited to a few selected compositions, the materials that can be fabricated through PSBEE cover a very wide range of compositions, from elemental metals, compositional complex alloys, ceramics, even to polymers. More importantly, while the ultrathin metals/ceramics so obtained possess a thickness from 10-100 nm, their in-plane size can reach 1 cm and above, therefore leading to an extremely high aspect ratio of up to 1 million. Compared to their bulk counterparts, these ultrathin materials display remarkable physical properties because of their unique nanostructures and low dimensionality. Apart from their fabrication and characterization, we also develop new facile methods to manipulate the ultrathin materials for the manufacturing of small-scale structures and devices that could find real applications.

Silk Revitalization for Advanced Applications - Dr FEI B.

Solid fibroin fibers (FFs) were directly cross-linked under visible light at room temperature for the first time. The chemical cross-link through dityrosine connection was confirmed by Fouriertransform infrared (FTIR) spectroscopy, fluorescence spectra, and a solubility test. The resultant cross-link density of fibers was calculated based on their swelling ratio evaluation in LiBr solution. Further applying stretch to the fibers during irradiation increased the fiber strength to higher values. The break stress and Young's modulus of photo-cross-linked FFs reached a 60–90% increase in comparison to the original FFs in dry and wet conditions. This easy strengthening approach is scalable industrially to enhance FFs in a wide range of applications.

Interstitial Oxygen in Additive Manufactured Titanium Alloys - Dr CHEN Z.

Additive manufactured Ti alloys have been extensively studied and used widely in many industries. For a long time, oxygen has been referred to as the 'kryptonite' to Ti, capable of invoking a strong hardening effect but resulting in dramatic embrittlement. Here, we demonstrate that interstitial oxygen can be incorporated into an additive manufactured Ti-6Al-4V alloy to improve its mechanical properties by forming an oxygen-containing FCC solid solution phase. State-of-the-art electron microscopy, atomic probe tomography, and density functional theories were used to reveal the crystallography, chemical details and thermal stability of the new FCC phase in the materials. Mechanical tests on bulk samples and in-situ compression tests of micropillars revealed that the oxygen-stabilized FCC-phase dramatically enhances the strength and ductility of the material. The discovery of the new phase provides a new alloy design strategy for aerospace industries.

Modeling and Trajectory Optimization in Additive Manufacturing of Continuous-fiber-reinforced Materials - Dr DUAN M.

Additive manufacturing of fiber-reinforced materials holds the promise of becoming the next generation of composite fabrication and additive manufacturing technologies. The potential to improve, modify, and diversify the properties of generic materials by introducing reinforcements draws significant attention from academia and industry. In this talk, different additive manufacturing techniques for fiber-reinforced materials will be presented and discussed. Particular focus will be placed on additive manufacturing with continuous fiber. A finite element model that accounts for the mechanical properties of the continuous-fiber-reinforced 2D part and trajectory optimization method will be presented.

The Design of Copper Microstructure for the Fast Killing of Virus - Dr LIU Y.

The pandemic of coronavirus SARS-COV-2 leads us to the question of how to make human society more reliable under the strike of virus. The virus with a high spontaneous mutation rate challenges the cognitive process and the development of antiviral agents. The killing of virus and bacteria on copper surfaces is known, and the mechanism is explained as copper ions released from a copper surface. On an ordinary copper surface, it will take a few hours to kill the virus. In this talk, we try to enhance the virus-killing reaction rate by the design of copper surface microstructure. We made a copper surface by depositing (111)–oriented nanotwin and studied the killing effect of Feline Infectious Peritonitis Virus (FIPV). By making clear the chemistry and physics mechanism behind virus killing on copper surfaces, we will try to increase the virus-killing rate further. In the future, we can make a copper filter for air quality control in public buildings, for example, the filter can be installed in the ventilation system, on the ceiling of restaurants, or in other common places to purify the air and prevent the spread of the contaminated air. We can also make recyclable copper masks for individual people.

Machine Learning-based Super-resolution Algorithm and its Application in Medical Images - Dr Eric TENG L.

Currently, with the progress of deep learning and computer vision technology, the image super-resolution (SR) problem has attracted more and more research interest. SR can be used in many different scenes such as video zoom, low-cost image quality enhancement, and so on. Many SR methods have been investigated to improve the quality of the generated image, however, most of them don't consider using the super big convolution kernel to achieve the feature mapping of the input image. In this research, we proposed a new machine learning model for SR by using multi-path and we use the big convolution kernel to get the feature of the image. we also added the structure loss and BIGAN structure to make the model more accurate without supervision. From the experimental results, our method achieves the best Peak signal-to-noise ratio (PSNR) and Structural similarity (SSIM) values compared with several existing SR algorithms. Besides, our observation also finds that our method keeps more details of the image and at the same time

the generated image is smoother. Finally, we will introduce some applications in the medical image domain.

Development of a Novel Magnetic Field-assisted Batch Superfinishing Method for Polishing of Freeform Surfaces - Dr WANG C.

The increasing demand of the superfinished freeform surfaces has stimulated the development and upgrade of the precision polishing technology. However, current ultra-precision polishing methods usually polish the workpiece one-by-one, leading to low production efficiency and high polishing cost. Even though some batch polishing methods have been developed for polishing a number of workpieces simultaneously, it is difficult for them to obtain high form accuracy, as well as nanometre scale surface roughness. Hence, we developed a novel magnetic field-assisted batch superfinishing (MABS) method which not only can implement nanometre scale batch polishing of freeform surfaces, but also can achieve high form maintainability. A theoretical and experimental investigation of the material removal in MABS process was conducted, including kinematic analysis of the brush motion, simulation of the magnetic field distribution and material removal distribution model. Moreover, experiments on both normal surfaces and freeform surfaces were also carried out. The results indicate that the MABS method is effective to obtain nanometric surface roughness together with micrometric form accuracy in batch polishing of both normal and freeform surfaces. This study sheds the light for the application of MABS in batch polishing of optical components and moulds, turbine blades, dental crowns, bio-implants, surgical knives, high-end jewelleries, etc.

Electrospinning Nanofibers for High Performance Rechargeable Batteries - Dr XU Z.

The combined effects of rapid growth in population and global energy demand as well as geopolitical and climate change issues motivate a policy change to renewable energy resources. Energy storage systems take the privilege to bridge the intermittent green energy resources and the electric devices. Rechargeable batteries have become indispensable in our modern life since its successful launch in 1990s. Conventional lithium ion batteries with graphite anodes and transition metal oxide cathodes are approaching their theoretical limit in energy densities (about 250 Wh/kg), which cannot meet the emerging and demanding applications, i.e., electric vehicles and smart grids. Exploring new electrochemistry and design/manufacturing advanced electrode materials for new battery systems with higher energy densities and lower cost become necessary and imperative. The electrochemical performance is tightly related to the micro- and nanostructures of electrode materials, which further rely on the manufacturing technologies. In this talk, I would like to introduce the electrospinning technique to produce various nanofibers applied in state-of-the-art electrochemical energy storage systems, including lithium-ion battery, lithium -sulfur batteries, sodium-ion battery and supercapacitors. The correlations among the electrospinning parameters, microstructures of nanofibers and the electrochemical performance will also be covered in the talk as explained our rich research experiences. In addition, this talk will also introduce cutting-edge characterization techniques, such as in-situ transmission electron microscopy, to unveil the working mechanisms of fibrous electrodes in working batteries under high spatial and temporal resolutions. Finally, an overview and outlook of other representative techniques to fabricate advanced energy storage materials will be given.

Numerical Investigation of the Generalized Impedance Boundary Condition for Sound Absorption Materials in Aerodynamic Flows: Preliminary Results - Dr ZHONG S.

The ability of a material to absorb sound is often characterized by a quantity named impedance. It is an indirect variable that is defined as the ratio of the sound pressure and acoustic particle velocity under normal incidence at a given frequency. Surprisingly, the variable with a fixed value is able to quantify the adequate in many practical problems when the sound is at arbitrary incidence. However, if there is surrounding aerodynamic flow, the impedance value of its current definition must be adjusted, depending on the flow speed and profile, making it elaborate to exactly determine the boundary condition. Recently, there was an insightful idea of generalized impedance boundary condition to introduce a matrix, rather than a single-valued variable, to account for the relation of sound pressure and particle velocity in both normal and tangent directions. In this work, computational aeroacoustics (CAA) study for benchmark problems is conducted using a proposed state space realization approach. Simplifications to the model are also made and examined using the CAA simulations. Initial results showed that the introduction of the tangent impedance could yield promising results with the experimental data. Further studies on this topic are still being done. Open questions will also be thrown out about the necessity of applying the generalized boundary condition for acoustic metamaterials where surface waves in the tangent directions often exist.

<u>Photos Taken at International Conference on Advances in Design, Materials and</u> <u>Manufacturing Technologies 2022 (ICADMMT 2022, 6/10/2022)</u>





Schedule of International Conference on Advances in Design, Materials and Manufacturing Technologies 2022 (ICADMMT 2022, 7/10/2022)

Location	Theme	Presentation	Presenter
(Attendance)	Theme	resentation	Tresenter
Hybrid mode	International	Design and development process	Ioanne VIP
Tryona mode	Conference on	of AL-assisted Personal Training	PolvII
Room UG06	Advances in	Gear to Monitor and Enhance	rorye
PolvU Hung Hom	Design. Materials	Exercise Performance	
Bay Campus.	and	Coherent Point Drift (CPD)	Oilong LIU
PolvU	Manufacturing	based automatic reorientation	PolvU
	Technologies	scheme in 4D scanning of active	1 01 9 0
And via:	8	human activity to eliminate	
Zoom		swinging movement	
		Investigation of Anti-vibration	Annie YU, KIT
(78 Participants		Glove Made of Silicone Inlaid	
including on-site		Spacer Fabric	
and online)		Novel Design of	Yin-Ching Doris
		One-size-fits-more Bra Cup and	KEUNG, PolyU
		Aerodynamic Cycling-Specific	, ,
		Sports Bra	
		Pedobarographic Statistical	Qiugiong Gaby
		Parametric Mapping of Plantar	SHI, PolyU
		Pressure Analysis in Unilateral	
		Transtibial Amputees during	
		Different Activities: A pilot	
		study	
		Improved Fire-retardant	Chun-wah YU,
		Performance of Epoxy Resin	PolyU
		Composites using Organic Fibre	
		Filler	
		Effect of Plasma Surface	Wing-yu CHAN,
		Activation on Bond Strength of	PolyU
		Flax/Epoxy Composites	
		Theoretical Analysis of	Bo ZHU, CPCE
		Mechanical Behavior of 3D	
		Spacer Materials throughout	
		Different Stage of Compression	
		Sustainability for Product	Yiteng SHI,
		Design	PolyU
		The Working Principles and	King-cheong
		Development of Aluminum-air	Antony
		Battery with Non-aqueous	LAM,CPCE
		Electrolytes	
		Gradient Nanotwinned CrCoNi	Shu-Qing YUAN,
		Medium-Entropy Alloy with	PolyU
		Strength-ductility Synergy	
		BCC \rightarrow HCP Phase Transition	Wen-Qing YANG,
		Significantly Enhancing the	PolyU
		Wear Resistance of Metastable	
		Refractory High-entropy Alloy	

	Urban Cultural Inheritance:	Jia-Hua DONG,
	Generative Adversarial	CUHK
	Networks (GANs) Assisted	
	Street Façade Design Based on	
	Indigenous Hakka Settlements in	
	Hong Kong	
	Perceived Value of Additive	Ka Hei CHOW,
	Manufacturing and	PolyU
	Customization Experience in	
	Toy Industry	
	Biocompatibility of Soft and	Abdul Wasy ZIA,
	Hard Diamond-like Carbon	NorthumbriaU
	Coatings for Biomedical	
	Applications	
	Automatic design elements	Hong OU. PolyU
	extraction and vectorization for	
	design support	
	An Agnostic Robotic Paradigm	Yin Yuen CHAN.
	in a Flexible Robotic and	PolvU
	Manufacturing Control System	
	Spin-orbit Torque in	Zivan LUO, CSU
	(Fe0 8Mn0 2)1-xPtx Single	
	Ferromagnetic Laver	
	A Paper-based Microfluidic	Lizhe CHEN
	Analytical Device with a Highly	XITLU
	Integrated On-Chip Valve for	
	Alzheimer's Disease Screening	
	Custom-Fit and Lightweight	Fuyuan LIU
	Optimization Design of	XITLU
	Exoskeletons Using Parametric	
	Conformal Lattice	
	Vibration Control of Camshaft	Hongyi LIU
	Swing Grinding Based on Local	IUST
	Resonance Mechanism	3001
	A novel built-up Constitutive	Zhicheng PENG
	Model of 40Cr Alloy Steel by	ILIST
	Considering the Size Effect with	0001
	Simulation Verification	
	Investigation on	Yan WANG
	Grinding-induced Cracking	IIIST
	Mechanism of 40Cr Steel	0001
	Camshaft	
	Design and Development of	Xiaolu I.I
	Sustainable Open-source	AiDLah
	Cultural-oriented Cheongsam	
	Pattern: An Approach to Cyclic	
	I attent. An Approach to Cyclic Utilization of Clothes	
	Cumzanon of Cloules	1

Design and development process of AI-assisted Personal Training Gear to Monitor and Enhance Exercise Performance - Kenny KWAN, Benson CHENG, Mei-Chun CHEUNG, Kit-Lun YICK, Sun-Pui NG and Joanne YIP

In this study, an AI-assisted wearable sensor-based personal training gear is designed and developed. The training gear equipped with different sensors which is used to simultaneously monitor posture, muscle activity and muscle fatigue in real-time during exercise. Wearer's exercise performance is evaluated based on collected sensor data and AI algorithms. Moreover, real-time feedback for enhanced physical performance and reduced risk of injuries is provided. A sweat-wicking, breathable, and skin tight fitting training gear is developed through a careful selection of materials and thorough testing. This garment collected reliable synchronized and continuous biometric data through sensors during exercise in real-time to monitor the activity of major muscle groups of the trunk and limbs. Finally, an 8-week experiment of resistance training will be done for a better understanding of the optimal posture and muscle activation patterns with different exercises through machine-learning approaches. A user interface will be developed to communicate with users and visualize training and AI output.

Coherent Point Drift (CPD) based automatic reorientation scheme in 4D scanning of active human activity to eliminate swinging movement - Qilong LIU, Kit-Lun YICK Sun-Pui NG and Yin-Ching KEUNG

With the rapid development of spatial scanning sensors and equipment like LiDAR and 4D ultra-sound scanners, applications in academia and industry are now merit from the 4D scanning technology, which can provide high time-resolution 3D image series of a dynamic object and record its most subtle dynamic changes. Researchers in motion analysis, ergonomics, and apparel design have launched early attempts into exploiting the potential of utilising 4D scanning to implement rigorous analysis of the dynamic motion and deformation of the human body during active activities. However, current workflows usually involve heavy manual intervention and post-processing, which profoundly limits the efficiency, availability, and scope of application, not to mention that human intervention is error-prone and may undermine the credibility of the analysis result. One of the common post-processing is body reorientation, which serves the purpose of reorienting the human body to a reference direction to eliminate the effect of the swinging movement during human activities, which is very common in walking, running, and other activities. For a typical 4D scanning advice, the rate of scanning can be as high as 120 frames per second (fps), which results in 7,200 3D images samples for reorientation in only 1 minute of scanning, leading to tension between man-power and frames cropping resulting in loss of information. Addressing this problem, a fully automatic scheme was proposed to implement the reorientation task in this research. Utilising the probabilistic model-based point cloud registration method, the Coherent Point Drift (CPD), the swinging movement of a female subject participating in a 4D scanning experiment was analysed and the parsed rotation matrix was used to offset the effect of swinging movement. Artificial swinging was also exerted to the 4D data to illustrate the robustness of the proposed method in large-scale swinging.

Investigation of Anti-vibration Glove Made of Silicone Inlaid Spacer Fabric - Annie YU and Yi-Lei WANG

Introduction

Anti-vibration glove is a kind of personal protective equipment to protect the hands when using vibrating hand tools, such as chainsaws, impact drivers, road breakers, ballast stop machines, etc. The materials used in the palm of anti-vibration gloves for vibration isolation are typically foam materials, resilient gel, air bladder and chloroprene rubber. The vibration isolation materials are usually air and moisture impermeable and palm has the largest sweat gland density. Therefore, sweats are easily trapped inside the gloves bringing discomfort. Spacer fabrics have not only good permeability and cushioning properties but are also able to isolate vibration. This study aims to investigate the feasibility of developing an anti-vibration glove with spacer fabric.

Methodology

Two anti-vibration glove samples with spacer fabric paddings on the palm were developed. One sample was inserted with conventional spacer fabric structure, while another was inserted with silicone tube inlaid spacer fabric. Two additional anti-vibration gloves were purchased from the market. The vibration transmissibility of the four samples was evaluated according to ISO 10819:2013, Mechanical vibration and shock – Hand-arm vibration – Measurement and evaluation of the vibration transmissibility of gloves at the palm of the hand.

Results and discussion

The results show that the glove samples made of spacer fabric can have comparable vibration isolation properties with the anti-vibration glove on the market. The spacer fabric glove samples can reduce the vibration in the frequency range of 500-1000Hz. The silicone tube inlaid into the spacer fabric structure shows slightly better vibration isolation. However, the performance of the spacer fabric gloves is not good at a low frequency under 500.

Conclusion

The developed gloves show the ability in vibration isolation and the possibility of using spacer fabric as the padding material. Further investigation and development on the spacer fabric structure is suggested to allow the anti-vibration glove to be effective over a wider frequency range. This study can act as a reference for further development of anti-vibration by using spacer fabric.

Novel Design of One-size-fits-more Bra Cup and Aerodynamic Cycling-Specific Sports Bra -Yin-Ching KEUNG, Joanne YIP, Kit-Lun YICK and Annie YU

As breasts can vary greatly in geometry with varying amounts of adipose tissues, quantifying their three-dimensional (3D) shape, size and volume together with posture variations during movement can be challenging. This project intends to incorporate a novel bra cup structure that provides a flexible fit of 3D breast shapes, as well as incorporate the concept of aerodynamics in speed sports to construct a cycling-specific sports bra to enhance breast support in unconventional upright standing postures during cycling or training for optimal fit, comfort and sporting performance.

With the lack of accurate and objective techniques to measure the geometric features of breasts together with the stringent quality requirements for bra fit, little is known about the influence of the changes in body orientation (such as leaning forward during cycling) on the characteristics of breast motion and the potential postural adaptations in such dynamic situations. To address this issue, the latest 4D body scanning system, which is a marker-less motion capture system (3dMD, Atlanta, GA), will be used to capture 360-degree progressive sequence of the body morphology including the complexities of breast geometry during motion. The dynamic changes of the surface of the body, stretching of the skin and geometric changes will be captured and analyzed to provide clarity on the movement of the soft tissues of the breasts. In order to accommodate the diverse shape and deformation of the breast, the novel bra cup is designed with a responsive auxetic structure to prototype the shape-changing properties and provide adequate support to the breast.

The study contributes to addressing the increasing concerns around health and wellbeing, while the findings benefit academics who are interested in breast ergonomics by providing scientific guidelines to predict the relationship between breast shape and the performance of bras, thus providing insights for the future development of activewear.

Pedobarographic Statistical Parametric Mapping of Plantar Pressure Analysis in Unilateral Transtibial Amputees during Different Activities: A pilot study - Qiuqiong Gaby SHI, Kit-Lun YICK and Pui Ling LI

Quantifying plantar pressure data has been used as a common method for the assessments of prostheses performances in unilateral transtibial amputees during walk. Most plantar pressure analysis software are user-friendly, however, the analysis of plantar regions were treated as

discrete and independently. This study applied pedobarographic statistical parametric mapping (pSPM) to visually investigate and compare plantar pressure differences between intact limb and prosthesis limb of unilateral transtibial amputees during different walking tasks. Five unilateral transtibial amputees (3 females, 2 males; 61 ± 7 years) joined this study. The participants' footprints were automatically built when they walked at 4.5 km/h speed with 5 different slopes (downhill 3 degrees, downhill 7 degrees, uphill 3 degrees, uphill 7 degrees, and 0 degree) on the treadmill (zebris Medical GmbH, Germany) equipped with Zebris FDM 1.14 software. 30-second rest was during each 2-minute walking task. The footprints processing and subsequently described statistical analyses by means of pSPM was implemented in Matlab r2018a (Mathworks corp., USA). Point clouds were registered within subject (WS) to a chosen template, defining as the point cloud by the highest number of points. The maximum pressure pictures were aligned vertically by using principal component analysis to yield the optimal points overlap. The root-mean-square error was calculated between the source and the template of each step for determining registration quality. Comparison of planter pressure between intact limb and prosthesis limb during each walk task was used by nonparametric-paired sample SPM1D t-test. This study highlighted the presence of significant pressure difference in the specific plantar region between two limbs during different walk tasks. The finding is visually and efficiently for the performance evaluation of prostheses product for amputees when compared with traditional plantar pressure data analysis.

Improved Fire-retardant Performance of Epoxy Resin Composites using Organic Fibre Filler - Chun-wah YU, Sun-pui NG, Chun-wah LEUNG, Chi-wai KAN and Wang-kin CHIU The use of flame retardants is commonplace in today's market, with a multitude of readily available types of flame retardants for use. However, most are not organic chemicals, and their manufacturing and use can harm the environment. Understanding the principles behind thermal degradation, such as the Bolland-Gee Reaction, and the role flame retardants play in quenching flames provides valuable insights into developing new and more environmentally friendly alternatives to the currently available chemicals. We have conducted a pilot experiment which included the use of wood flour as a main ingredient for an eco-flame retardant solutions, which is infused in epoxy resin. 3 samples were created and were tested in accordance to the UL-94 vertical burn test to confirm their effectiveness in flame retardancy. Results indicated that pure wood flour/ epoxy resin was only able to achieve a V-2 rating, with the fire lasting roughly 60 The addition of HPCTP, a commercially available seconds before extinguishing. phosphorus-nitrogen based flame retardant, was able to reduce burning time to within 5 seconds, achieving a V-0 rating. Further analysis suggested that charring of wood flour combined with the foaming effect of nitrogen and phosphorus chemicals released was able to create an intumescent layer on the surface of the sample, thus blocking heat and fuel transfer to the fire. Such findings indicated that the addition of organic material such as wood flour can contribute to overall flame retardancy of the material. Moreover, it is possible that by replacing HPCTP with an organic phosphorus-nitrogen based compound can yield similar results.

Effect of Plasma Surface Activation on Bond Strength of Flax/Epoxy Composites - Wing-yu CHAN, Sun-pui NG, Chun-wah LEUNG, Chi-wai KAN and Wang-kin CHIU

As the environmental issues caused by the manufacturing processes of man-made materials, natural fiber composites (NFCs) were widely studies in various engineering applications with its high strength, low density, biodegradability and renewability. However, the interfacial bonding between the hydrophilic plant fiber and hydrophobic resin in composites is relatively weak. This study aims to explore the effectiveness of utilizing atmospheric plasma treatment to enhance the bond strength of flax/epoxy composites. Air plasma, argon plasma and nitrogen plasma treatments were adopted for the flax fabrics at 21.4 mm/s. Composite plates using plasma-treated flax fabrics and untreated fabrics at 00 were made by using the vacuum infusion technique. The contact angles between droplets (water and canola oil) and plasma-treated and untreated fabrics were examined

separately by the Contact Angle (CA) measurements. Fourier Transform Infrared Spectroscopy (FTIR) was also carried out to investigate the chemical composition of both plasma-treated and untreated fabric surfaces. The interfacial bond strengths of composite materials were evaluated in terms of interlaminar shear strengths by the Short Beam Shear (SBS) tests. The results of CA measurement showed that the absorption time of nitrogen plasma-treated flax fabric was reduced over 40% of when compared that of untreated composites due to the formation of C=O bonds. SBS tests showed that the average interlaminar shear strength of argon plasma-treated flax/epoxy composite samples was improved by 14.27% when compared that of untreated composites.

Theoretical Analysis of Mechanical Behavior of 3D Spacer Materials throughout Different Stage of Compression - Bo ZHU

In recent years, 3D spacer materials, composed of two face layers and one core layer, have attracted increasingly attention from interdisciplinary researchers and engineers, and have become a hot topic covering the areas of energy absorption, impact resistance, vibration control, dynamic protection in the industry of mechatronics, constructions, biomechanics, biomedicines, automobiles, synthetic and functional devices, etc. A lot of innovative structural patterns with base materials have been investigated, which produce unique properties beyond the natural and conventional materials. In particular, many efforts have been made to experimentally, numerically, and theoretically study the compressive behavior of 3D spacer materials under out-of-plane pressure. However, most of previous analysis was limited to the initial stage of compression, and there was little analytical analysis on all the possible parameters and conditions, as well as their effects on the mechanical properties of 3D spacer materials. Based on Euler's theory of bending, this presentation introduces the theoretical model of the large deformation behavior of 3D spacer materials, throughout the entire process of compression until densification, taking all relevant parameters and design variables into consideration. Typical stages of compression are identified and distinguished with different mechanisms, and the force-deformation responses are analytically predicted in each stage, whereby the effect of each design variable is quantitatively expressed in mathematics. Moreover, the connection between the core and face layers, and the initial curvature and spatial density of filaments in the core layer are modelled and incorporated in the theoretical prediction. To sum up, the theoretical model covers the complete process of compression, and considers a wide range of design variables, thus it provides a comprehensive guideline to optimize the design of 3D spacer materials, so as to achieve specific performance desired in practical application.

Sustainability for Product Design - Yiteng SHI

In today's highly competitive and uncertain market environment with short life cycles, product development must not only satisfy the quality and speed of production, as environmental issues are highly concerned in these years, we as a designer share a social responsibility to turn the product into more innovative and recyclability value. As recyclability plays an important role in new product development, it can be utilized in search of novel ideas for innovative product design, and also can be regarded as a helpful tool in advancing product design output.

There are three design strategies for designers referring to. (1) Design for Low Waste is a strategy to tackle the waste issue at source by using the zero-waste design method at the onset, and by reusing and repurposing both pre and post-consumer textile waste into designs. (2) Designers have the ability to adapt the use of low-impact materials and production methods that reduce energy and raw material consumption and minimize the discharge of pollution entering the ecosystem. (3) Designers have a major role in aiding the establishment of emotional connection to the product for their customers that can come from the quality, durability and/or education in consumer care.

The Working Principles and Development of Aluminum-air Battery with Non-aqueous Electrolytes - King-cheong Antony LAM and Kam-wai SHE

Due to the continuous consumption of Lithium, the price of Lithium will continuously raise which is the reason why the price of Lithium battery could not go down. Apart from Lithium (Li), Aluminum is the most attractive metal anode among the earth abundant elements. It is the fifth most abundant element in the earth crust and it has a high specific capacity of 2978 mAh/g which is comparable to that of lithium (3860 mAh/g). The electrochemical reaction of Al involves three electrons which renders it has an extremely high volumetric capacity of 8040 mAh/cm3, which is four times larger than that of Lithium (2060 mAh/cm3). Besides, the price of Aluminum is the cheapest among abundant metal, only 1/150 to Lithium which means it could greatly reduce the price of rechargeable battery. Aluminum-air batteries have drawn considerable attention from companies and researchers since they are a promising source of energy for future generations of electric vehicles (EVs) because they use oxygen from the air as cathode, reducing the weight and the cost of the battery and permitting higher space for energy storage. However, there is a major problem of Aluminum-air battery before coming to commercial market, which is the development of a compatible, efficient and economic electrolyte. The electrolytes used in Aluminum battery include aqueous liquid electrolyte, non-aqueous liquid electrolyte and solid electrolyte. In this seminar we will introduce the recent development and working principles of Aluminum-air battery with non-aqueous liquid electrolyte.

Gradient Nanotwinned CrCoNi Medium-Entropy Alloy with Strength-ductility Synergy -Bin GAN, Lei QIAN, Bo WU, Chi-Fai CHEUNG, Hong-Hui WU, Xu-Sheng YANG and Shu-Qing YUAN

In this study, a high-strain rate ultra-precision machining technology named single point cubic boron nitride turning is developed to fabricate a gradient nanotwinned CrCoNi medium entropy alloy layer. The grain size of the ~ 150 μ m-thick gradient layer is gradually refined from the original ~ 17 μ m to ~ 25 nm in the topmost surface, exhibiting a significantly enhanced yield strength (from ~ 450 MPa to ~ 1100 MPa) and well-retained ductility of ~ 27%. High-resolution transmission electron microscope and atomistic simulations were mainly performed to unveil the size-dependent twinning mechanisms governing the gradient refinement process from the core to the topmost surface, i.e. transiting from the parallel twins segmenting ultrafine grains, twin-twin intersections refining rhombic blocks and rotating the intersected nanograins, and finally to the zero-macrostrain deformation nanotwinning in the refined nanograins. The machining process provides sufficient equivalent stress to activate the twinning partials for forming the gradient nanotwinned structure.

$BCC \rightarrow HCP$ Phase Transition Significantly Enhancing the Wear Resistance of Metastable Refractory High-entropy Alloy - Xu-Sheng YANG and Wen-Qing YANG

In this paper, cold rolling (55% reduction in thickness) plus different annealing temperatures were performed on the as-cast TiZrHfTa0.5 metastable refractory high-entropy alloy. The most bcc \rightarrow hcp phase transition was found in the cold-rolled plus 870 oC-annealed specimens (average grain size of ~ 30 µm), which exhibit the lowest coefficient of frictions (0.12-0.15) and wear rates ((4.08-9.68) × 10-5 mm3/N•m) under the dry-sliding loads of 16 N to 64 N at room temperature, relative to the as-cast and cold-rolled specimens with lower annealing temperatures. Atomic-scale observations revealed that composition-segregated bcc \rightarrow hcp phase transition is further activated in the self-organized gradient worn subsurface, where the dual-phase structure with increased hcp phase fraction continues accommodating the repeated sliding-caused plasticity. Accordingly, two kinds of atomic movement mechanisms of bcc \rightarrow hcp phase transition were dissected to be mainly executed by the cooperation of atom shuffling or/and partial dislocation dipoles gliding.

Urban Cultural Inheritance: Generative Adversarial Networks (GANs) Assisted Street Façade Design Based on Indigenous Hakka Settlements in Hong Kong - Provides NG and Jia-Hua DONG

In Hong Kong, Hakka settlements are habitats of the indigenous populations who have been engaging in agricultural and fishing activities for more than 200 years; especially in the New Territories, which has a special place in Hong Kong's colonial and policy history (Kong, 2018). However, these settlements are gradually being abandoned as ghost towns due to rapid urbanisation, where the city is progressively constructing high-density habitats to accommodate the exponentially increased population since the 1950s (Wong, 2013). Although urban renewal may help in modernising old urban fabrics and standardisation lowers the marginal costs of construction, it can sometimes produce homogeneous environments that are not inclusive to varying community needs (Jacobs, 1961). While visual qualities of historic street spaces may generate a sense of cultural identity and belonging, it may be difficult to accommodate highrise typologies and other contemporary needs (Wiener, 2005; Raman, 2014). This challenges designers to rethink means of preserving cultural heritage, while engaging in continuous urban renewal processes. This study investigates workflows to detect historical building styles in one of the most densely-populated cities in the world - Hong Kong - that can be further applied as a suggestive design decision-making tool for style infilling on urban renewal to maintain urban culture inheritance.

Eversince Goodfellow (2014) designed Generative Adversarial Networks (GANs) using two competitive neural networks, the evolution of image-to-image translation has been accelerated, and GANs has shown high potential in stylised design in many disciplines, including architecture (Ashwath, 2020; Khairadeen Ali & Lee, 2021; Del Campo, 2021). GANs may be used to suggest design options that act as a communicative interface between human and computer visions (Khairadeen Ali, 2021). GANs have a few variants, including CycleGAN, which enables the adding of more generators and discriminators to train unpaired images and facilitates more flexibility in training processes for design and decision-making (Avinash, 2022; Zhu et al., 2017). In particular, Sun et al. (2022) work on fine tuning the algorithms and optimising the dataset in cycleGAN assisted facade generation, which has successfully tested and applied to other urban blocks.

This ongoing research project develops a methodology on GANs-assisted automatic generation of façade design comprising four steps - dataset collection, data processing, style customisation, and performance testing - in the Hakka settlements of Hong Kong. Firstly, façade photos of these historical settlements will be collected and composed into a dataset that embeds cultural information. Secondly, an OpenCV camera calibration will be used to autocorrect image distortion to ensure the quality of images, and image segmentation will be used to label characteristic elements of the façades and reproduce large number of epochs to ensure the accuracy of the labelled dataset. Thirdly, CycleGAN will be used to train both labelled façades and original photo dataset to build architectural style transfer models. Finally, results of generated façades will be adapted to another district to test performance. If the results are positive, the next step of the project would be to deploy the generated model as a social engagement and interactive public communication tool on urban cultural heritage.

Perceived Value of Additive Manufacturing and Customization Experience in Toy Industry -Tak Tin TSANG and Ka Hei CHOW

Additive manufacturing is one of the manufacturing methods. It has a lot of potent and applied to different industries already. The toy industry is a potent industrial to combine this new manufacturing method to fulfil customer requirement. Customer requirement is a critical thing to study in the modern business strategy. Customer perceived value is one of the things that affect the purchasing behavior of the customer. Therefore, to study what the customer thinking of when

they are purchasing is the key to success nowadays. In the study, it identifies how customization affects the perceived value of the customer. The Customer Perceived Value Tool is used to investigate to the perceived value of customer buy toys. The basic values of customization are utilitarian value, uniqueness value, self-express value. New value would create through the co-design process, which is hedonic value and creative achievement value. A survey is used to collect the feeling of the customer. Also, a structural equation model is built to evaluate the different sources of perceived value. In addition, Amos has applied to analyze the model for statistical analysis. In order to apply the new values on additive manufacturing, some mechanical testing and studies are required to find out the ideal parameter set of 3D printing which satisfy the customer perceived value toward the new values. It found that the most applicable set is using linear as infill pattern and using high infill percentage i.e. 45%. Also, Stereolithography (SLA) has a better performance in printing toys, rather the Fused Deposition Modeling.

Biocompatibility of Soft and Hard Diamond-like Carbon Coatings for Biomedical Applications - by Ioannis ANESTOPOULOS, Mihalis I. PANAYIOTIDIS, Martin BIRKETT, Abdul Wasy ZIA

Diamond-like carbon (DLC) coatings are rapidly emerging for biomedical applications due to their superior hardness, Young's modulus, antiwear and biocompatibility properties. DLC coatings have shown their potential to improve bio-mechanical performance of various artificial implants such as orthopaedic joints, orthodontic components, vascular grafts, stents, heart valves and diaphragms, catheters etc. The biocompatibility of DLC coatings is well investigated over other engineering materials and also for different substrate systems. However, the DLC growth which tunes its biocompatibility is not yet systematically investigated. In this work, DLC coatings are deposited with varying bias voltage using a sputtering system. The coatings are characterised to measure changes in atomic structure, hardness, and Young's modulus. The biocompatibility of bias-varied DLC coatings is measured with L929 mouse fibroblast cells. It is observed that soft DLC coatings may not always be the best choice, therefore, DLC with appropriate hardness should be chosen for specific biomedical applications.

Automatic Design Elements Extraction and Vectorization for Design Support - Hong QU, Yanghong ZHOU, K.P. CHAU and P.Y. MOK

Raster image and vector graphic are two common file formats for any visual designs like graphic designs or textile, which serve different purposes in design. Raster image, made of pixels, is a format mainly for design presentation in digital means, which is difficult to edit and the quality of the image is determined by the amount of pixels (resolution). Vector graphic consists of several mathematics-described geometric primitives, which is easy to edit and resolution independent. Vector graphic is therefore the file format mainly used in design creation. The process of converting raster images to vector graphics, known as vectorization, is helpful for editing and reusing existing designs. Typically, design pattern is a combination of several repeating design elements organized based on the designers' aesthetic and experience. In industry, designers often take existing design patterns as recourses to create new designs, especially design elements and spend a lot of time vectorizing them for further use. Unfortunately, the tedious process is mainly conducted manually and takes time. It will be wonderful to automatically extract and vectorize design elements from existing design patterns to support design works. We propose a novel method with two parts, dealing with two specific problems, core design element extraction and vectorization, respectively. In particular, we apply unsupervised segmentation to assist in design element extraction to overcome the problem of lacking labeled design pattern datasets; and we propose a design element decomposition method for vectorization based on color quantization. Extensive experiments on design patterns demonstrate the effectiveness of the proposed method. Particularly, our method extracts and vectorizes one image's inside core design elements takes around 13 seconds. The output vectorized design elements are more compact than common

business software and are easier to reuse for new design creation. Furthermore, a vector-based design element dataset is built for design support.

An Agnostic Robotic Paradigm in a Flexible Robotic and Manufacturing Control System - Yin Yuen CHAN and Kam K. H. NG

With the rapid development and implementation of the robotic solutions, agnostic robotic paradigm (ARP) is an emerging trend to cope with rich artificial objects environments. Academics and industrial practitioners are widely enhancing the scalability and effectiveness of robotic enterprise solutions. However, different functions and software of robotics and facilities are being launched in the market. The compatibility of different brands of robotics and facilities is worth to be considered. Therefore, the objective of the paper is to investigate implementation of the emerging ARP for the Industrial Internet of Things (IIoT) and resource synchronisation flexible robotic and facility control system to address this challenge. This paper aims to investigate and design a modularised robotic and facility control system and its AI edge intelligence and cloud-edge computing. The system is expected to provide a seamless system integration approach with overarching functionality, capable of connecting with different types of a robotic and facility units by using smart-edge devices. The new edge devices are still functional and have a less marginal investment on further edge device design.We adopted simultaneous localisation and mapping (SLAM) as one of the edge intelligence, provided the simulation results, and tested with multiple parameters under different conflicts.

Spin-orbit Torque in (Fe0.8Mn0.2)1-xPtx Single Ferromagnetic Layer - Ziyan LUO

Spin-orbit torque in heavy metal/ferromagnet heterostructures with broken spatial inversion symmetry provides an efficient mechanism for manipulating magnetization using a charge current. We report the presence of a spin torque in a single ferromagnetic layer in both asymmetric MgO/Fe0.8Mn0.2 and symmetric MgO/Fe0.8Mn0.2/MgO structures, which manifests itself in the form of an effective field transverse to the charge current. The current to effective field conversion efficiency, which is characterized using both the nonlinear magnetoresistance and second-order planar Hall effect methods, is comparable to the efficiency in typical heavy metal/ferromagnet bilayers. We argue that the torque is caused by spin rotation in the vicinity of the surface via impurity scattering in the presence of a strong spin-orbit coupling. Instead of cancelling each other, the torques from the top and bottom surfaces simply add up, leading to a fairly large net torque, which is readily observed experimentally. Besides, we also investigated the effect of the Pt composition on the spin-orbit torque in a (Fe0.8Mn0.2)1-xPtx single-layer ferromagnet. We observed that while the field-like torque decreases and even reverses sign with increasing the Pt composition, the damping-like torque increases monotonically and reaches 0.99 Oe/(1010 A/m2) in a single-layer (Fe0.8Mn0.2)0.52Pt0.48 film. The results corroborate the anomalous Hall effect and surface spin rotation model presented previously, and the relative ratio between the damping-like and field-like torques can be qualitatively understood as the relative phase change in spin-conserving and spin-flip scattering.

A Paper-based Microfluidic Analytical Device with a Highly Integrated On-Chip Valve for Alzheimer's Disease Screening - Lizhe CHEN, Tianyu CAI, Sixuan DUAN and Pengfei SONG

Alzheimer's Disease (AD) is one of the leading dementias in the aging population globally, raising the awareness of developing a novel early screen method for AD to reduce the health risk. Current diagnosis methods of cognitive testing show a deficiency in identifying atypical AD, and biomarker-enabled methods are time-consuming, expensive, and invasive. Here we report a microfluidic paper-based analytical device (μ PAD), featuring fast, low-cost, and user-friendly, capable of conducting autonomous enzyme-linked immunosorbent assay (ELISA) for AD screening through the A β 42. Unlike existing valving methods on μ PADs, this rotary valve allows regulation of multiple flows with a single valve, leading to ease of assembly and small footprint

with a high integration level. The micromotor-controlled valve is also programmable, highly reliable, and has a fast response (76 \pm 0.6ms, n=20, ~500 times faster than previous smart material-enabled valves on μ PADs). Clinical validation using serum samples (n=22) collected from healthy and AD patients, given that this design has 100% sensitivity and 100% specificity in diagnosis with certain criterions, and comparison between this design and conventional A β 42 ELISA also suggests a consistent result indicating its strong reliability. We further anticipate that this design will be widely applied for large-scale AD screening in point-of-care settings, upon the device features and clinical validations.

Custom-Fit and Lightweight Optimization Design of Exoskeletons Using Parametric Conformal Lattice - Fuyuan LIU, Xi'an Jiaotong-Liverpool University

The high fabrication freedom of additive manufacturing (AM) opens up an avenue for material innovation. Mesoscale lattice material, as a periodic and porous material, possess low relative density and customized mechanical properties, such as high specific stiffness, good energy absorption, and superb thermal insulation. Hence, it has been a superior candidate for achieving lightweight design. Both morphology and arrangement of lattice material play an essential role on improving macroscopic mechanical performance of structure. A challenge is designing and populating lattices to improve the weight-to-stiffness ratio of industrial components. This research includes two parts: one is to customize lattice material with superior mechanical properties based on the Generative design method; another is to achieve the infilling optimization for arbitrary industrial components by the designed material. The rationale of the study is an automate and iterative design exploring and optimizing progress by means of evolutionary algorithm. The morphology of lattice material is described by a parametric design method and optimized by Genetic Algorithm and Neural Network. And Swarm intelligence achieves the infilling optimization by the designed material for complex industrial components. The feasibility of the proposed method is verified, illustrated by exoskeleton design, sport helmet, and mandible implant. The research provides a constructive reference for customized and lightweight design in the exploration of AM-based structural material.

Vibration Control of Camshaft Swing Grinding Based on Local Resonance Mechanism - Hongyi LIU

Camshaft usually vibrates violently in swing grinding due to its complex contour, and the damping performance of device directly affects the surface quality of camshaft. Aiming at the problem that the traditional vibration damping device has been forced by installation constraints and it is difficult to control the vibration frequency in a specific range, based on the local resonance bandgap mechanism, this paper uses the cylindrical shell and the cross structure to suppress the main vibration at the camshaft journal and the grinder tailstock, respectively. By determining the maximum vibration frequency and its vibration mode, the corresponding finite element model is established, and the resonant bandgap characteristics and the bandgap influence rules of each system structure are discussed. Based on the optimized vibration reduction model obtained from the influence rules, the damping performance of the system before and after vibration reduction is compared. The results show that the vibration reduction effect of the cylindrical shell and the cross structure is very significant. Compared with the homogeneous structure, the damping performance at the journal and tailstock is improved by 31.6% and 89.3%, respectively. The process optimization achieves the goal that controlling large wavelength with small size, breaking through the installation constraints of traditional devices, which provides a good application prospect for the local resonant phononic crystal in the vibration reduction field of camshaft swing grinding.

A Novel Built-up Constitutive Model of 40Cr Alloy Steel by Considering the Size Effect with Simulation Verification - Zhicheng PENG

An accurate constitutive model is essential for modeling and simulation of metal processing. It is usually built by the Hopkinson compression bar(SHPB) test. However, the previous studies had rarely considered the specimen size effect in the test, which reduced the accuracy of the model. Hence, a novel built-up constitutive model considering the size effect was developed to accurately describe the constitutive relationship of 40Cr alloy steel. First of, the ratio of height to cross-sectional area (length \times width) of a rectangular body is defined as the dimensional coefficient, and the SHPB tests with various specimens and loading strain rates were designed to obtain the stress-strain curves. The experimental results show that the mechanical properties of 40Cr alloy steel show an obvious size effect. The true stress decreases and the strain increases with the increase of the specimen size coefficient. Secondly, a new constitutive model is established by supplementing the dimension coefficient. It consisted of two parts, one is to describe the dynamic mechanical behavior before peak stress-strain, and the other one is to describe the dynamic mechanical behavior after peak stress-strain. Accordingly, a finite element simulation model is established. The results show that the new model had better accuracy than the traditional J-C constitutive model. The constitutive model proposed in this paper can be applied to the finite element simulation models of impact, machining, and residual stress.

Investigation on Grinding-induced Cracking Mechanism of 40Cr Steel Camshaft - Yan WANG

For mechanical workpieces, there will be higher machining accuracy requirements and smaller surface roughness values in practical applications. Therefore, the use of abrasive tools to remove surface materials at higher linear speeds is used. The generation of grinding cracks during the grinding process will adversely affect the service performance of the workpiece and even cause the workpiece to be scrapped. However, the formation mechanism of grinding cracks is still unclear at present. The setting of appropriate grinding process parameters is conducive to the reduction of surface roughness, the reduction of surface stress concentration, and the improvement of fatigue life of parts. At the same time, during the grinding process, the surface of the workpiece will cause hardening phenomenon and residual stress. The introduction of the hardened layer is conducive to the improvement of the resistance to crack initiation, and the generation of residual compressive stress on the surface of the grinding workpiece is also conducive to improving the performance of the parts. Fatigue life improvement. In this regard, this study characterizes the morphology of the crack initiation on the surface of the oscillating grinding cam, analyzes the initiation and propagation mechanism of grinding crack from perspectives of microstructure, work hardening, and residual stress, and the reasons for the formation of grinding crack is explored in depth. Based on the experimental results and analysis, the generation mechanism of grinding cracks is clarified, and measures to prevent the grinding cracks are proposed.

Keywords: 40Cr steel, cam, grinding crack, residual stress.

Design and Development of Sustainable Open-source Cultural-oriented Cheongsam Pattern: An Approach to Cyclic Utilization of Clothes - Xiaolu LI, Jun ZHANG and Joanne YIP

Sustainability-oriented designs are indispensable to enable sustainable production. However, the conceptual potential of open design for promoting sustainability has been sparsely explored in practice. Hence this study aims to investigate building a sustainable open-source Shanghai cheongsam design platform in which patterns can be automatically made by individual anthropometric data and confirm community culture and aesthetics.

Mixed research methods that combined qualitative and quantitative methods were used in this study. Specifically, the qualitative study, including observation, semi-structured interviews, and workshops, were conducted to investigate the relationship among aesthetical pleasure, the cultural

environment of the Shanghai community, and Shanghai cheongsam design. Then quantitative data of detailed anthropometric measurement, including cervical height, shoulder height, waist height, bust circumference, waist circumference, hip circumference, shoulder width, back width, and upper arm girth, was collected. The quantitative result was then combined with the qualitative result to build an openly shared Toolkit for Shanghai cheongsam design.

The result showed that bust circumference, waist circumference, hip circumference, and upper arm girth were key indicators to build the open-source pattern design model that could be generalized to most populations in the community. Besides, with the involvement of participatory design and open design, intangible culture and social identity were conceptualized into a solid framework for database construction. Design elements that consist of structure construction, surface graphics, and coloring matching were established in the proposed Toolkit. "Open-Source Patchwork Cheongsam Making Manual Version 1.0" were built to guide users modify their design. The open-source Toolkits was proved to be a good connection tool within the community, which promotes the community to create a closed-loop system for efficiently recycling clothing. The practical application of this cyclic clothing utilization system lays a solid foundation for open-sourced cultural-oriented Shanghai Cheongsam design and also provides insights for creating a zero-waste ecosystem in the garment design industry. Appendix II(c) – Consultancy projects/ services conducted by RCADMM Team Members (and Associate Team Members)

Duration	Project Title (Client)	Task Description	Investigator of RCADMM	Funding (HK\$)
9/2019 – 8/2020	Honorary Academic Advisor (CDCC Charity Foundation Ltd)	To advise student project works relating to engineering in secondary schools	Dr Anand VYAS	N/A
4/2020 – 3/2021	Academic Advisor on HKIE Accreditation (PolyU-AAE Dept)	To advise PolyU-AAE to undergo the HKIE professional accreditation	Prof LEUNG CW	100,000
9/2020 - 8/2021	Thermal Analysis of Server Room (EMSD HKSAR)	To perform thermal analysis of a server room with aid of CFD and experimental validation	Dr Udaya KAHANGAMAGE	40,000
1/2020 - 12/2020	Quality Advisor (The Hong Kong Jockey Club)	Investigation on geometrical tolerance and weight analyses of the Mark-Six lottery balls	Dr Anand VYAS	20,000
1/2020 - 12/2020	Honorary Advisor (Huizhou Hungtach Industrial Ltd)	To review and advise the techniques in applying coating deposition as well as the related quality	Dr Anand VYAS	Honorarium to be fixed later
1/2020 - 12/2020	Advisor of Mask Production (Full Sky Technology Ltd)	To advise the manufacturing of protective masks especially on ultrasonic welding of strings with masks	Dr Anand VYAS	20,000
1/2020 - 12/2020	Technical Consultant (The Green Technology Consortium Ltd)	Development and testing of organic polymers with the graphene dispersions technique	Dr Zerance NG SP	40,000
8/2020 – 8/2022	Honorary Consultant (Huizhou Hungtach Industrial Limited, Huizhou)	To provide advice on the application of surface coating to match the new product design	Dr Anand VYAS	N/A
9/2020 - 12/2023	Development of Indoor Safety Tracker (Mapxus)	To develop the indoor safety tracker with robotic vision technology	Dr CHAU James C.P.	20,000

1/2021 – 12/2023	Green Packaging Materials (Belfino Group Global Ltd.)	To conduct the research and development of Green Packaging Materials for consumer products	Dr NG Zerance S.P.	100,000
6/2021 – 12/2023	One-dimensional (1D) Tin-based Perovskite Nanorod Solar Cell (PolyU Applied Physics)	To fabricate and then test the optoelectronic performance of the one-dimensional (1D) tin-based perovskite nanorod solar cell	Dr LAM Antony K.C.	30,000
7/2021 – 6/2023	Lifting Beam Using in Construction Sites (Honour Consultant Company Limited)	To conduct the design, analysis and testing of Lifting Beam in Construction Sites	Dr NG Zerance S.P.	24,000
9/2021 – 8/2022	Honorary Technical Advisor of Mask Production (The Full Sky Technology Limited-Dr Mask Social Enterprise)	To advise on the mechanical movement, fabric selection and filtering efficiency of the mask during the mask design, development, and production processes	Dr Anand VYAS	N/A
10/2021 – 9/2023	Development and Testing of Organic Polymers (Green Technology Consortium Ltd.)	To develop and test the Organic Polymers with the Graphene Dispersions Technique	Dr NG Zerance S.P.	30,000

<u>Appendix III – Design projects conducted by RCADMM Members (and Associate Members)</u> <u>with collaborative effort to design and develop materials/ systems to satisfy</u> <u>the industrial or community needs</u>

Duration	Project Title	Task Description	Investigator of RCADMM	Collaborator Unit
4/2020 – 3/2021	Safety location tracker	To design and develop the device for elderly which has a fall detection function as well as indoor position function to ensure home safety.	Dr James CHAU C.P.	Mapxus
8/2020 – 7/2021	Mechanical design of WeFarm project	To design the better paths to implement the "Autonomous Organic Farming".	Dr Udaya KAHANGAMAG E	WeFarm Ltd
7/2020 – 12/2021	AI-assisted personal training gear for muscle strength training	To design AI-assisted personal training gear to monitor and enhance exercise performance. This brings inexhaustible application possibilities of the project outputs in healthcare and sports sectors.	Dr Zerance NG S.P.	Institute of Textiles and Clothing, PolyU
10/2020 – 3/2022	"Soft Manikin System" aided sports bra design	To apply the "Soft Manikin System" to evaluate the 3D dynamic positioning and breast movement with post-exercise pressure sensation for "Sports Bra" design.	Dr Zerance NG S.P.	Institute of Textiles and Clothing, PolyU
1/2020 – 12/2022	To design and develop the feasible and reliable fuels for internal combustion engines by applying the concept of blending hydrogen with hydrocarbon fuel	To investigate the thermal efficiency, engine power output, and emission characteristics of internal combustion engines (both SI and CI engines) operating with blended hydrogen/ hydrocarbon fuels. The main objective is to design the suitable and reliable blended fuels.	Prof LEUNG C.W.	School of Engineering, Hainan University, Hainan, China

9/2020 – 12/2023	Development of Indoor Safety Tracker	To develop the indoor safety tracker with robotic vision technology	Dr CHAU James C.P.	Mapxus
6/2021 – 12/2022	Development of one-dimensional (1D) Tin-based perovskite nanorod solar cell	 To design and fabricate the one-dimensional Tin-based perovskite nanorod solar cell To modify the optoelectronic performance of the developed cell through prototype testing. 	Dr LAM Antony K.C.	Department of Applied Physics, PolyU
1/2021 – 12/2022	Develop the most safe and reliable low-carbon domestic fuel with hydrogen blending method ^{D1}	 To develop the blended hydrogen/ LPG low-carbon fuel for safe and reliable domestic application To design the delivery, storage and burning of the blended hydrogen/ LPG low- carbon fuel 	Prof LEUNG C.W. and Dr Udaya KAHANGAMAGE	School of Mechanical & Electrical Engineering, Hainan University, China
1/2021 – 12/2023	Design and develop the refrigerant-free refrigeration/ cooling device for air-conditioning system ^{D2}	 To design and develop a refrigeration/ cooling device without using the traditional refrigerant To optimize the cooling efficiency of the developed refrigeration/ cooling device when it is integrating to the air-conditioning system 	Prof LEUNG C.W. and Dr ZHANG Flora H.	School of Mechanical Engineering, Xiamen University, China
1/2021 – 12/2023	Development of plant-fiber reinforced polymer composites with enhanced mechanical and flame-retardant properties ^{D3}	 To develop plant-fiber reinforced polymer composites with enhance mechanical and flame-retardant properties To consider its application to domestic and industrial sectors 	Dr NG Zerance S.P.	Institute of Textiles and Clothing, PolyU
7/2021 – 6/2023	Design of Lifting Beam using in construction sites	To conduct the design, analysis, and prototype testing (essentially on strength, reliability, and safety) of Lifting Beam using in construction sites	Dr NG Zerance S.P.	Honour Consultant Company Limited

9/2021 - 8/2022	Honorary Technical Advisor of Mask Production	To advise on the mechanical movement, fabric selection and filtering efficiency of the mask during the mask design, development, and production processes	Dr Anand VYAS	The Full Sky Technology Limited-Dr Mask Social Enterprise
1/2022 – 12/2024	Modelling of Quantitative Dynamic Fit of Respirators for Healthcare Workers RGC Competitive Research Funding Scheme - Faculty Development Scheme	 To investigate the 3D geometrical changes of human face during dynamic motions through the development of an efficient scanning approach for building of 3D geometric face models To evaluate the fit of respirator in dynamic conditions To formulate biomechanical finite element models for 	Dr NG Zerance S.P.	Institute of Textiles and Clothing, PolyU
		subjects with different face shapes and sizes		
7/2022 - 12/2023	A Novel Low-cost Prosthetic Foot Design for Unilateral Transtibial Amputees at Elevated Activity Levels	 To formulate the design and structural features of prosthetic feet for unilateral transtibial amputees at elevated activity levels based on a biomechanical study of gait performance To analyze the influence of mechanical properties in relation to stiffness and energy storage, together with the design features of prosthetic foot liner that affecting the pressure distribution, thermal comfort, and the acceptance of the device To devise a low-cost prosthetic feet design for 	Dr NG Zerance S.P.	Hong Kong Amputees Association Limited & School of Fashion and Textiles, PolyU
		unilateral transtibial amputees used for elevated activity levels		



Appendix III – Setup to Facilitate the Design Projects – D1, D2 and D3




<u>Appendix IV(a) – Conference presentations conducted by RCADMM Team Members (and</u> <u>Associate Team Members) in 2020-2022</u>

(Total: 49 Conference Presentations)

- P1. Chau, C.P., (2020). A vision-based pedestrian counting system using edge computing technique. Paper presented at Research Centre for Advanced Design, Materials, and Manufacturing Technologies Seminar Roadmap for research development and recent technology in computer vision, Hong Kong.
- P2. Chen, Y., (2020). Indirect evaporative cooler design for efficient energy recovery in air-conditioning systems. Paper presented at Research Centre for Advanced Design, Materials, and Manufacturing Technologies Seminar Advanced engineering design, material enhancement and financial policy for Industry 4.0, Hong Kong.
- P3. Kahangamage, U., (2020). 3D-printing of bio-inspired composites. Paper presented at Research Centre for Advanced Design, Materials, and Manufacturing Technologies Seminar – Advanced development in AI, materials, and manufacturing technologies, Hong Kong.
- P4. Leung, C.W., (2020). *The roadmap for the CPCE to becoming university*. Paper presented at Research Centre for Advanced Design, Materials, and Manufacturing Technologies Seminar Roadmap for research development and recent technology in computer vision, Hong Kong.
- P5. Leung, W.Y., (2020). Strength enhancement of stainless steel 304 through surface mechanical attribution treatment (SMAT). Paper presented at Research Centre for Advanced Design, Materials, and Manufacturing Technologies Seminar Advanced engineering design, material enhancement and financial policy for Industry 4.0, Hong Kong.
- P6. Liang, S.J. and Zhu, J., (2020). *The design of symmetric acoustic meta-lens*. Paper presented at PHSK 2020.
- P7. **Vyas A., Leung C.W.** and Wong W.O., (2020). *Effectiveness and Challenges in Engineering Education During Covid-19: A Case Study of Hong Kong*. Paper presented at Conference for Higher Education Research – Hong Kong 2020 (CHER-Hong Kong 2020), Hong Kong.
- P8. Vyas, A. and Zhou, Z.F., (2020). Sputter deposited Nanocomposite Cr-based Films and their Characterization. Paper presented at 4th International Conference on Mechanical Engineering and Applied Composite Materials (MEACM2020), Beijing, China. (Also accepted for publication by Springer as Springer Nature: Mechanism and Machine Science)
- P9. Vyas, A., Leung, C.W. and Wong, W.O., (2020) *Effectiveness and challenges in engineering education during Covid-19: a case study of Hong Kong*, Conference for Higher Education Research Hong Kong 2020 (CHER-Hong Kong 2020), Nov 13-14.
- P10. Ng, S.P., (2020). Sound absorption performance of 3D spacer fabrics in composite structures. Paper presented at Research Centre for Advanced Design, Materials, and Manufacturing Technologies Seminar Advanced development in AI, materials, and manufacturing technologies, Hong Kong.

- P11. Wu, Y., (2020). Incentive policy mechanism and financial subsidies for EV industry in China. Paper presented at Research Centre for Advanced Design, Materials, and Manufacturing Technologies Seminar – Advanced engineering design, material enhancement and financial policy for Industry 4.0, Hong Kong.
- P12. Yao, Y., Khan, S., ZHONG, J., Li, S., & Chen, W., (2021). Automated Knee Cartilage Thickness Measurement from Magnetic Resonance Images. Paper presented at ISMRM Annual Meeting 2021, Online.
- P13. Yiu, N.S.N., Lau, Y.Y., & Tang, Y.M., (2021). *Handling COVID-19 at work under the occupational safety and health legislation*. Paper presented at CPCE Health Conference 2021, Hong Kong.
- P14. Lau, Y.Y., (2021). *COVID-19: A new direction of logistics industry*. Paper presented at Webinar: New International Perspectives on the "Belt and Road", Maritime Silk Road Society, Hong Kong.
- P15. Lau, Y.Y., & Yip, T.L., (2021). Fundamental shifts of cruise shipping in the post COVID-19 era. Paper presented at 14th International Conference of Asian Shipping and Logistics, Seoul, South Korea.
- P16. Lau, Y.Y., & Yip, T.L. (2021). *Business innovations of cruise ship*. Paper presented at 3rd International Conference on Plant & Molecular Biology, Cleveland, USA.
- P17. Lau, Y.Y., Chan, I., & Sum, C., (2021). Nurturing sub-degree students with professionalism

 An experience to instill growth mindset and self-determination through competition. Paper presented at The Qualitative Report Conference, Florida, USA.
- P18. Lau, Y.Y., Chan, I., Sum, C., & Cheng, J., (2021). *Exploring Sub-degree Students to Learn Desirable Difficulties: The Study of Project-Based Learning*. Paper presented at International Conference on Learning and Teaching 2021, Hong Kong.
- P19. Siu, K.W.M., & Lo, C.H. (2021). Ergonomic Consideration for the Design of Tactile Guide Paths for New Urban Changes and Needs. In C. S. Shin, G. Di Bucchianico, S. Fukuda, Y-G. Ghim, G. Montagna, & C. Carvalho (Eds.), Advances in Industrial Design - Proceedings of the AHFE 2021 Virtual Conferences on Design for Inclusion, Affective and Pleasurable Design, Interdisciplinary Practice in Industrial Design, Kansei Engineering, and Human Factors for Apparel and Textile Engineering, 2021 (pp. 289-299). (Lecture Notes in Networks and Systems; Vol. 260). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-3-030-80829-7_36
- P20. Wong, Y.L., & Lo, C.H. (2021). Human Factors in Waste Reduction Design: A Case Study on Using Garbage Bags Under Waste Charging Policy in Hong Kong. In F. Rebelo (Ed.), *Advances in Ergonomics in Design - Proceedings of the AHFE 2021* (pp. 971-981). (Lecture Notes in Networks and Systems; Vol. 261). Springer Science and Business Media Deutschland GmbH. <u>https://doi.org/10.1007/978-3-030-79760-7_116</u>
- P21. Tam, E.W.S., Yip, J., Yick, K.L., Ng, S.P., & Fang, C., (2021). Investigation of Anatomical Shape of Thumb of de Quervain's Tenosynovitis Patients. In R. S. Goonetilleke, S. Xiong,

H. Kalkis, Z. Roja, W. Karwowski, & A. Murata (Eds.), Advances in Physical, Social and Occupational Ergonomics - Proceedings of the AHFE 2021 Virtual Conferences on Physical Ergonomics and Human Factors, Social and Occupational Ergonomics, and Cross-Cultural Decision Making, 2021 (pp. 346-352). (Lecture Notes in Networks and Systems; Vol. 273). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-3-030-80713-9_44

- P22. Wong, C.S.H., Yip, J., Yick, K.L., & Ng, Z.S.P., (2021). A Case Study of Initial In-Brace Spinal Correction of Anisotropic Textile Brace and Boston Brace. In J. Kalra, N. J. Lightner, & R. Taiar (Eds.), Advances in Human Factors and Ergonomics in Healthcare and Medical Devices - Proceedings of the AHFE 2021 Virtual Conference on Human Factors and Ergonomics in Healthcare and Medical Devices, 2021 (pp. 109-115). (Lecture Notes in Networks and Systems; Vol. 263). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-3-030-80744-3_14
- P23. Lau, K.H., Qureshi, U.M., Silva, B., & Hancke, G.P., (2021). Mobile Proximity Channel Using Vibration. In *IECON 2021 - 47th Annual Conference of the IEEE Industrial Electronics Society* (IECON Proceedings (Industrial Electronics Conference); Vol. 2021-October). IEEE Computer Society. https://doi.org/10.1109/IECON48115.2021.9589526
- P24. Liu, Y., Hancke, G.P., & Qureshi, U.M., (2021). Off-the-Shelf Security Testing Platform for Contactless Systems. In D. Maimut, A-G. Oprina, & D. Sauveron (Eds.), *Innovative Security Solutions for Information Technology and Communications - 13th International Conference, SecITC 2020, Revised Selected Papers* (pp. 13-23). (Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics); Vol. 12596 LNCS). Springer Science and Business Media Deutschland GmbH. <u>https://doi.org/10.1007/978-3-030-69255-1_2</u>
- P25. Liu, Y., Qureshi, U.M., & Hancke, G.P., (2021). *Feasibility of Inferring Keystrokes on PEDs with Sensors from Mobile Devices*. Paper presented at the 30th IEEE International Symposium on Industrial Electronics (ISIE), Tokyo.
- P26. Liu, M., Guan, J. and Lau, Y.Y., (2022). *探索澳門發展葡語系國家融資租賃業務的可能 性*, Paper presented at 中國會計發展:方向與路徑"專題研討會, Nanjing, China.
- P27. Chan, M.H., **Lau**, **Y.Y.** and Lee, W.Y., (2022). *The future of sustainable clothing industry: Reimagine, regenerate, and close the loop.* Paper presented at Academy of International Business Asia Pacific Regional Conference, Ningbo, China.
- P28. Chan, M.H., Lau, Y.Y. and Lee, H.P.R., (2022). *Environmental sustainability in the fashion industry*. Paper presented at Academy of International Business Asia Pacific Regional Conference, Ningbo, China
- P29. Poo, M.C.P., **Lau, Y.Y.** and Yang, Z., (2022). *Network analysis for global shipping network under the influence of Arctic shipping*. Paper presented at International Conference of Hong Kong Society for Transportation Studies, Hong Kong.

- P30. Lau, Y.Y., Pimtong, T. and Xu. J.B., (2022). *How to solve global supply chain fault in Hong Kong?* Paper presented at Asian Logistics Round Table, Incheon, South Korea.
- P31. Chen, Q., Ge, Y.E. and Lau, Y.Y., (2022). The impact of the COVID-19 on global cruise vessel density and emission. Paper presented at World Transport Convention, Wuhan, China.
- P32. Chen, Q, Ge, Y.E. and Lau, Y.Y., (2022). Carbon emissions and carbon allocation of global fishing vessels under the post-pandemic. Paper presented at World Transport Convention, Wuhan, China.
- P33. Lau, Y.Y., Wu, Y.A. and Wu, J.A., (2022). *Introducing smart campus with consideration* of carbon neutralization A sample study in Hong Kong. Paper presented at Asian Logistics Round Table, Incheon, South Korea.
- P34. Chen, Q, Ge, Y.E., Lau, Y.Y., Dulebenets, M.A., Ng, A.K.Y. and Wang, Z., (2022). *Capturing effects of COVID-19 on global cruise vessel density and emissions*. Paper presented at 13th International Workshop on Computational Transportation Science, Xi'an, China.
- P35. Kanrak, M., Lau, Y.Y., Ling, X., Chen, Q. and Traiyarach, S., (2022). *Complex network topology of the low-cost air passenger transport network*. Paper presented at International Association of Maritime Economists Conference, Busan, South Korea.
- P36. Lau, Y.Y., Wong, S. and Chan, G.H.H., (2022). *Building resilient vaccine supply chain in the use of cloud-based blockchain*. Paper presented at SHAPE International Symposium, Phutthamonthon, Thailand.
- P37. Lau, Y.Y. and Leung, A., (2022). The adoption of new funeral technology in the crisis of COVID-19 pandemic, Paper presented at SHAPE International Symposium, Phutthamonthon, Thailand.
- P38. Chow, Y.T., Wong, C.Y. and Lau, Y.Y., (2022). *Preliminary study of drone delivery systems in Hong Kong*. Paper presented at IEEE World Conference on Applied Intelligence and Computing, Sonbhadra, India.
- P39. Lau, Y.Y. and Ng, A.K.Y., (2022). A resilience assessment framework for port's critical infrastructures during a pandemic. Paper presented at International Conference of Asian Shipping and Logistics, Seoul, South Korea.
- P40. Lau, Y.Y., Lam, W. and Chan, I., (2022). A study of workplace safety perception: The *attitude of weather change leadership*. Paper presented at International Conference of Asian Shipping and Logistics, Seoul, South Korea.
- P41. Kanrak, M., Ling, X., Lau, Y.Y. and Traiyarach, S., (2022). *Analysis of connections between river cruise ports in Asia: A network structure perspective*. Paper presented at International Conference of Asian Shipping and Logistics, Seoul, South Korea.
- P42. Kanrak, M., Lau, Y.Y. Nguyen, H.O. and Ling, X., (2022). *Effect of emission control area* (*ECA*) regulations on the cruise shipping network. Paper presented at 11th International Forum on Shipping, Ports, and Airports, Hong Kong, China.

- P43. Liang, Y., Guan, J. and Lau, Y.Y., (2022). Competitiveness analysis of medium-sized airports: Study based on a tourism city. Paper presented at CAUTHE 2022 Conference, Brisbane, Australia.
- P44. Lau, Y.Y., Yip, T.L. and Ana, C., (2022). Coronavirus disease 2019 (COVID-19) driven social transformation of cruise industry. Paper presented at 2022 World of Shipping Portugal Conference, Portugal.
- P45. Chan, E.M.H., Cheng, F.H., Ho, D., Lee, L. and Lau, Y.Y., (2022). *Design revolution: Rebuilding a more sustainable fashion industry in the aftermath of COVID-19.* 16th Academy of Innovation, Entrepreneurship, and Knowledge Conference, Valencia, Spain.
- P46. Singh, P., Dulebenets, M.A., Pasha, J., Gonzalez, E.D.R.S., Lau, Y.Y. and Kampmann, R., (2022). Advantages and obstacles in the deployment of autonomous trains in rail transportation. Paper presented at Transportation Research Board, Washington, USA.
- P47. **Zhu, B.**, (2022). Sensing Technology of Large Deformation and Impact Force on 3D Flexible Man-machine Interface. Paper presented at Conference on Advanced Materials and Processing Technologies 2022, Hong Kong.
- P48. Zhu, B., (2022). Theoretical Analysis of Mechanical Behavior of 3D Spacer Materials throughout Different Stages of Compression. Paper preented at The International Conference on Advances in Design, Materials and Manufacturing Technologies, Hong Kong.
- P49. Lam, W.M., Chan, P.C.A. and Olawumi, O.T., (2022). *Development of Sustainable Building Design in Hong Kong: Exploring Lean Capabilities*. Paper presented at Water Resources Resilience for Small Island Developing States (SIDS), Trinidad.

<u>Appendix IV(b) – Journal papers published by RCADMM Team Members (and Associate Team Members) in 2020-2022</u>

(Total: 125 Journal Papers. # Publication involving inter-institutional collaboration.)

- J1. Sun, T., Huang, X., **Chen, Y.** and Zhang, H. (2020). Experimental investigation of water spraying in an indirect evaporative cooler from nozzle type and spray strategy perspectives. *Energy and Buildings*, UNSP 109871.
- J2. Min, Y., Chen, Y., Yang, H. and Guo, C. (2020). Characteristics of primary air condensation in indirect evaporative cooler: Theoretical analysis and visualized validation. *Building and Environment*, UNSP 106783.
- J3. Sun, T., Huang, X., Qu, Y., Wang, F. and **Chen, Y.** (2020). Theoretical and experimental study on heat and mass transfer of a porous ceramic tube type indirect evaporative cooler. *Applied Thermal Engineering*, UNSP 115211.
- J4. Chen, Y., **Kahangamage, U.**, Zhou, Q., and Leung, C.W. (2020). Can hydrogen enriched biogas be used as domestic fuel? Part 1: thermal characteristics of blended H₂/biogas impinging flames. *HKIE Transactions: Theme Issue on Hydrogen Power*, accepted for publication.
- J5. **Kahangamage, U.**, Chen, Y., Zhou, Q., and Leung, C.W. (2020). Can hydrogen enriched biogas be used as domestic fuel? Part 2: pollutants emission from combustion of biogas/H₂/air fuel mixture", *HKIE Transactions: Theme Issue on Hydrogen Power*, accepted for publication.
- J6. Zhou, Q., Cheung, C.S., **Leung, C.W.**, Li, X.T. and Huang, Z.H. (2020). Explosion characteristics of bio-syngas at various fuel compositions and dilutions in a confined vessel. *Fuel*, Vol. 259, UNSP 116254.
- J7. Wei, Z.L., Zhen, H.S., **Leung, C.W.**, Cheung, C.S. and Huang, Z.H.(2020). Effects of H₂ addition on the formation and emissions of CO/NO₂/NOx in the laminar premixed biogas-hydrogen flame undergoing the flame-wall interaction. *Fuel*, Vol. 259, UNSP 116257.
- J8. Zhen, H.S., Zhang, T.Y., Wei, Z.L., Chen, Z.B., Huang, Z.H. and **Leung, C.W.** (2020). An experimental examination of the role of turbulence on flame impingement heat transfer. *Fuel*, Vol. 268, UNSP 117329.
- J9. Zhen, H.S., Wang, Z.W., Liu, X.Y., Wei, Z.L., Huang, Z.H. and **Leung, C.W.** (2020). An experimental study on the effect of DC electric field on impinging flame. *Fuel*, Vol. 274, UNSP 117846.
- J10. Wei, Zhi-long, Zhen, Hai-sheng, **Leung, Chun-wah**, Cheung, Chun-shun and Huang, Zuo-hua (2020). Formations and emissions of CO/NO₂/NO_X in the laminar premixed biogas-hydrogen flame undergoing the flame-wall interaction: effects of the variable CO₂ proportion. *Fuel*, Vol. 276, UNSP 118096.
- J11. Liu, T., Ma, G.C., Liang, S.J., Gao, H., Gu, Z.M., An, S.W. and Zhu, J. (2020). Single-sided acoustic beam splitting based on parity-time symmetry. *Physical Review B*, Vol.102 (1).

- J12. Gao, H., Gu, Z.M., Liang, S.J., An, S.W., Liu, T. and Zhu, J. (2020). Coding meta-surface for talbot sound amplification", *Physical Review Applied*, Vol. 14 (5).
- J13. Liang, S.J., Liu, T., Gao, H., Gu, Z.M., An, S.W. and Zhu, J. (2020). Acoustic meta-surface by layered concentric structures", *Physical Review Research*, Vol. 2 (4).
- J14. Mak, K.L. and Loh, W.K. (2020). Using Monte Carlo simulation for vehicle emission estimation a case study in Hong Kong. *Journal of Applied Sciences*.
- J15. Lo, C.O. and Loh, A.W.K. (2020). Hilbert-Schmidtness of weighted composition operators and their differences on hardy spaces. *Opuscula Mathematica*, Vol. 40, No. 4, pp. 495-507.
- J16. Lo, C.O. and Loh, A.W.K. (2020). Compact weighted composition operators between L^p-spaces. *Bulletin of the Australian Mathematical Society*, Vol. 102, No. 1, pp. 151-161.
- J17. Lo, C.O. and Loh, A.W.K. (2020). Weighted composition operators between Lorentz spaces. Bulletin of the Australian Mathematical Society, accepted for publication, 2020.
- J18. Chow, L., Yick, K.L., Kwan, M.Y., Yuen, C.F., Ng, S.P., Yu, A. and Yip, J. (2020). Customized fabrication approach for hypertrophic scar treatment: 3D printed fabric silicone composite. *International Journal of Bioprinting*, Vol. 6 (2), pp. 1-12.
- J19. Yu, A., Yick, K.L., Ng, S.P., Yip, J. and Chan, Y.F. (2020). A study of using a simple 2D image analysis method to monitor the surface area of hypertrophic scars on hand during pressure therapy. *Burns*, Vol. 46 (7), pp. 1548-1555.
- J20. Lee, C.W., Yick, K.L., Ng, S.P. and Yip, J. (2020). Soft manikin as tool to evaluate bra features and pressure. *International Journal of Fashion Design, Technology, and Education*, Vol. 13 (2), pp. 204-212.
- J21. Huang, M., Yick, K.L., Ng, S.P., Yip, J. and Cheung, R.T.H. (2020). The effect of support surface and footwear condition on postural sway and lower limb muscle action of the older women. *PLoS ONE*, Vol. 15 (6), e0234140.
- J22. Wong, S.H., Yip, J., Lo, K.Y.C., Cheung, K.M.C., Cheung, J.P.Y., Kwan, K.Y.H.K., Yick, K.L. and Ng, S.P. (2020), Non-invasive treatment of adolescent idiopathic scoliosis: systemic literature review by using citation network analysis. *Spine and Surgery*, Vol. 1 (1), 9:1-9:9, DOI: <u>http://dx.doi.org/10.31487/j.SSG.2020.01.01</u>.
- J23. Kwan, M.Y., Yick, K.L., Chow, L., Yu, A., Ng, S.P. and Yip, J. (2020). Impact of postural variation on hand measurements: three-dimensional anatomical analysis. *Human Factors*, accepted for publication.
- J24. Andrew Wu, Y., Artie Ng, W., Yu, Z.C., Huang, J., Meng, K. and Dong, Z.Y. (2020). A review of evolutionary policy incentives for sustainable development of electric vehicles in China: strategic implications. *Energy Policy*. Volume 148, Part B, UNSP 111983.
- J25. Al-Rashid, M.A., Goh, H.C., Harumain, Y.A.S., Ali, Z., Campisi, T., & Mahmood, T. (2021). Psychosocial barriers of public transport use and social exclusion among older adults: Empirical evidence from Lahore, Pakistan. *International Journal of Environmental Research and Public Health*, 18(1), 1-23. 185. <u>https://doi.org/10.3390/ijerph18010185.</u>

- J26. Sun, H., Ali, Z., & Wei, L. (2021). The impact of management support on individual learning opportunity and creativity performance in Hong Kong manufacturing companies. *Journal of Manufacturing Technology Management*. https://doi.org/10.1108/JMTM-01-2021-0001.
- J27. Riaz, F., Qyyum, M.A., Bokhari, A., Klemeš, J.J., Usman, M., Asim, M., Awan, M.R., Imran, M., & Lee, M. (2021). Design and energy analysis of a solar desiccant evaporative cooling system with built-in daily energy storage. *Energies*, 14(9), 2429. <u>https://doi.org/10.3390/en14092429</u>.
- J28. Asim, M., Kashif, F., Umer, J., Alvi, J.Z., Imran, M., Khan, S., Zia, A.W., & Leung, M.K. H. (2021). Performance assessment and working fluid selection for novel integrated vapor compression cycle and organic Rankine cycle for ultra-low grade waste heat recovery. *Sustainability (Switzerland)*, 13(21), 11592. <u>https://doi.org/10.3390/su132111592</u>.
- J29. Fung, Y.N., **Chan, H.L.**, Choi, T.M., & Liu, R. (2021). Sustainable product development processes in fashion: Supply chains structures and classifications. *International Journal of Production Economics*, 231, 107911. https://doi.org/10.1016/j.ijpe.2020.107911.
- J30. Shen, B., Xu, X., **Chan, H.L.**, & Choi, T.M. (2021). Collaborative innovation in supply chain systems: Value creation and leadership structure. *International Journal of Production Economics*, 235, 108068. <u>https://doi.org/10.1016/j.ijpe.2021.108068</u>.
- J31. Sing, M., Chan, J., Liu, H., & Ngai, N.H. (2021). Developing an analytic hierarchy process-based decision model for modular construction in urban areas. *Journal of Engineering, Design and Technology*. <u>https://doi.org/10.1108/JEDT-05-2021-0242.</u>
- J32. Ho, W.T., & Yu, F.W. (2021). Variable importance for chiller system optimization and sustainability. *Engineering Optimization*. <u>https://doi.org/10.1080/0305215X.2021.1881078</u>
- J33. Ho, W.T., & Yu, F.W. (2021). Chiller system optimization using k nearest neighbor regression. *Journal of Cleaner Production*, *303*, 127050. https://doi.org/10.1016/j.jclepro.2021.127050.
- J34. **Ho, W.T.**, & Yu, F.W. (2021). Predicting chiller system performance using ARIMA-regression models. *Journal of Building Engineering*, *33*, 101871. https://doi.org/10.1016/j.jobe.2020.101871.
- J35. **Ho, W.T.**, & Yu, F.W. (2021). Improved model and optimization for the energy performance of chiller system with diverse component staging. *Energy*, *217*, 119376. <u>https://doi.org/10.1016/j.energy.2020.119376</u>.
- J36. Chen, Y., **Kahangamage, U.**, Zhou, Q., & Leung, C.W. (2021). Can hydrogen enriched biogas be used as domestic fuel? part I thermal characteristics of blended biogas/H₂ impinging flames. *HKIE Transactions Hong Kong Institution of Engineers*, 28(2), 60-67. https://doi.org/10.33430/V28N2THIE-2020-0040.
- J37. Kahangamage, U., Chen, Y., Zhou, Q., & Leung, C.W. (2021). Can hydrogen enriched biogas be used as domestic fuel? part II: Pollutants emission from combustion of biogas/H₂/air fuel mixture. *HKIE Transactions Hong Kong Institution of Engineers*, 28(2), 68-74. <u>https://doi.org/10.33430/V28N2THIE-2020-0042</u>.

- J38. Chen, Q., Lau, Y.Y., Ge, Y.E., Dulebenets, M.A., Kawasaki, T., & Ng, A.K.Y. (2021). Interactions between Arctic passenger ship activities and emissions. *Transportation Research Part D: Transport and Environment*, 97, 102925. https://doi.org/10.1016/j.trd.2021.102925.
- J39. Chen, Q., Ge, Y.E., Ng, A.K.Y., Lau, Y.Y., & Tao, X. (2021). Implications of Arctic shipping emissions for marine environment. *Maritime Policy and Management*. <u>https://doi.org/10.1080/03088839.2021.1990427</u>.
- J40. Lau, Y.Y., Lu, C.S., & Weng, H.K. (2021). The effects of safety delivery and safety awareness on passenger behavior in the ferry context. *Maritime Policy and Management*, 48(1), 46-60. <u>https://doi.org/10.1080/03088839.2020.1750720.</u>
- J41. Pasha, J., Dulebenets, M.A., Fathollahi-Fard, A.M., Tian, G., Lau, Lau, Y.Y., Singh, P., & Liang, B. (2021). An integrated optimization method for tactical-level planning in liner shipping with heterogeneous ship fleet and environmental considerations. Advanced Engineering Informatics, 48, 1-18.
- J42. Theophilus, O., Dulebenets, M.A., Pasha, J., Lau, Y.Y., Fathollahi-Fard, A.M., & Mazaheri, A. (2021). Truck scheduling optimization at a cold-chain cross-docking terminal with product perishability considerations. *Computers and Industrial Engineering*, 156, 107240. <u>https://doi.org/10.1016/j.cie.2021.107240.</u>
- J43. Lau, Y.Y., Tang, Y.M., Chau, K.Y., & Ho, Y.H. (2021). Pilot study of heartbeat sensors for data streaming in virtual reality (VR) training. *International Journal of Innovation*, *Creativity and Change*, *15*(3), 30-41.
- J44. Dong, L.L., Cheung, C.S., & Leung, C.W. (2021). Heat transfer characteristics of an impinging swirling inverse diffusion butane/air flame jet. *Experimental Thermal and Fluid Science*, *128*, 110438. https://doi.org/10.1016/j.expthermflusci.2021.110438.
- J45. Zhen, H.S., Wang, Z.W., Liu, X.Y., Wei, Z.L., Leung, C.W., & Huang, Z.H. (2021). A study on impingement heat transfer characteristics of partially premixed flames on double-concentric-pipe burner. *Fuel*, 284, 119018. https://doi.org/10.1016/j.fuel.2020.119018.
- J46. Zhen, H.S., Wei, Z.L., Liu, X.Y., Wang, X.C., Huang, Z.H., & Leung, C.W. (2021). A state-of-the-art review of lab-scale inverse diffusion burners & flames: From laminar to turbulent. *Fuel Processing Technology*, 222, [106940]. https://doi.org/10.1016/j.fuproc.2021.106940.
- J47. An, S., Liu, T., Liang, S., Gao, H., Gu, Z., & Zhu, J. (2021). Unidirectional invisibility of an acoustic multilayered medium with parity-time-symmetric impedance modulation. *Journal of Applied Physics*, *129*(17), 175106. <u>https://doi.org/10.1063/5.0039432.</u>
- J48. Gu, Z., Fang, X., Liu, T., Gao, H., Liang, S., Li, Y., Liang, B., Cheng, J., & Zhu, J. (2021). Tunable asymmetric acoustic transmission via binary meta-surface and zero-index metamaterials. *Applied Physics Letters*, 118(11), 113501. https://doi.org/10.1063/5.0046756.
- J49. Gu, Z., Liu, T., Gao, H., Liang, S., An, S., & Zhu, J. (2021). Acoustic coherent perfect absorber and laser modes via the non-Hermitian dopant in the zero index metamaterials.

Journal of Applied Physics, 129(23), 234901. https://doi.org/10.1063/5.0040201.

- J50. Gu, Z., Gao, H., Liu, T., Liang, S., An, S., Li, Y., & Zhu, J. (2021). Topologically Protected Exceptional Point with Local Non-Hermitian Modulation in an Acoustic Crystal. *Physical Review Applied*, 15(1), 014025. https://doi.org/10.1103/PhysRevApplied.15.014025.
- J51. Lo, C.O., & Loh, A.W.K. (2021). Interpolating and uniqueness sequences for de Branges– Rovnyak spaces. *Ricerche di Matematica*. <u>https://doi.org/10.1007/s11587-021-00583-3</u>.
- J52. Chow, L., Yick, K.L., Sun, Y., Leung, M.S.H., Kwan, M.Y., Ng, S.P., Yu, A., Yip, J., & Chan, Y.F. (2021). A Novel Bespoke Hypertrophic Scar Treatment: Actualizing Hybrid Pressure and Silicone Therapies with 3D Printing and Scanning. *International Journal of Bioprinting*, 7(1), 123-134. <u>https://doi.org/10.18063/ijb.v7i1.327.</u>
- J53. Fok, Q., Yip, J., Yick, K.L., & Ng, S.P. (2021). Design and fabrication of anisotropic textile brace for exerting corrective forces on spinal curvature. *Journal of Industrial Textiles*. https://doi.org/10.1177/15280837211032619.
- J54. Kwan, M.Y., Yick, K.L., Chow, L., Yu, A., Ng, S.P., & Yip, J. (2021). Impact of postural variation on hand measurements: Three-dimensional anatomical analysis. *PLoS ONE*, *16*(4 April), e0250428. <u>https://doi.org/10.1371/journal.pone.0250428</u>.
- J55. Lee, C.W., Yick, K.L., Ng, S.P., & Yip, J. (2021). Analysis of dynamic vertical breast displacement for the design of seamless moulded bras. *Journal of the Textile Institute*. https://doi.org/10.1080/00405000.2021.1896452.
- J56. **Tong, H.Y.**, & Ng, K.W. (2021). Development of bus driving cycles using a cost effective data collection approach. *Sustainable Cities and Society*, *69*, [102854]. <u>https://doi.org/10.1016/j.scs.2021.102854</u>.
- J57. **Tong, H.Y.**, & Ng, K.W. (2021). A bottom-up clustering approach to identify bus driving patterns and to develop bus driving cycles for Hong Kong. *Environmental Science and Pollution Research*, 28(12), 14343-14357. <u>https://doi.org/10.1007/s11356-020-11554-w.</u>
- J58. **Vyas, A.**, & Zhou, Z.F. (2021). Sputter Deposited Nanocomposite Cr-Based Films and Their Characterization. *Mechanisms and Machine Science*, *99*, 245-255. https://doi.org/10.1007/978-3-030-67958-3_27.
- J59. Wong, S., Yeung, J.K.W., Lau, Y.Y., & So, J. (2021). Technical sustainability of cloud-based blockchain integrated with machine learning for supply chain management. *Sustainability (Switzerland)*, *13*(15), 8270. <u>https://doi.org/10.3390/su13158270.</u>
- J60. Wong, C.H.S., Tsang, K.C.K., & Chiu, W.K. (2021). Using Augmented Reality as a Powerful and Innovative Technology to Increase Enthusiasm and Enhance Student Learning in Higher Education Chemistry Courses. *Journal of Chemical Education*, 98(11), 3476-3485. <u>https://doi.org/10.1021/acs.jchemed.0c01029.</u>
- J61. Yeung, J., Wong, S., & Tam, A. (2021). Data analytics architectures for e-commerce platforms in cloud. *International Journal for Applied Information Management*, *1*(1), 1-5.

- J62. Lee, L.K., Cheung, T.K., Ho, L.T., Yiu, W.H., & Wu, N.I. (2021). A cross-platform game for learning computational thinking with the support of collaborative learning. *International Journal of Innovation and Learning*, 30(3), 334-357. https://doi.org/10.1504/IJIL.2021.118188.
- J63. Wu, Y.A., Ng, A.W., Yu, Z., Huang, J., Meng, K., & Dong, Z.Y. (2021). A review of evolutionary policy incentives for sustainable development of electric vehicles in China: Strategic implications. *Energy Policy*, 148, 111983. https://doi.org/10.1016/j.enpol.2020.111983.
- J64. **Wut, T.M**., & Lee, S.W. (2021). Factors affecting students' online behavioral intention in using discussion forum. *Interactive Technology and Smart Education*. https://doi.org/10.1108/ITSE-02-2021-0034.
- J65. Yu, F.W., & Ho, W.T. (2021). Tactics for carbon neutral office buildings in Hong Kong. Journal of Cleaner Production, 326, 129369. https://doi.org/10.1016/j.jclepro.2021.129369.
- J66. Li, Z., Peng, C., Ming, T., Shi, T., Zhang, H., Wen, C.Y., Lu, X., Dong, X., Richter, R.D., & Li, W. (2021). Review on the dispersion of traffic-related air pollutants in urban areas: Local mitigation strategies, optimization framework, and evaluation theory. *Building and Environment*, 198, 107890.
- J67. Li, Z., **Zhang, H.**, Wen, C.Y., Yang, A.S., & Juan, Y.H. (2021). The effects of lateral entrainment on pollutant dispersion inside a street canyon and the corresponding optimal urban design strategies. *Building and Environment*, *195*, 107740. <u>https://doi.org/10.1016/j.buildenv.2021.107740</u>.
- J68. **Zhang, H.**, Zhao, R., & Wen, C.Y. (2021). Performance Deterioration of Pitot Tubes Caused by In-Flight Ice Accretion: A Numerical Investigation. *International Journal of Aerospace Engineering*, 2021, 5599116. <u>https://doi.org/10.1155/2021/5599116</u>.
- J69. Yang, S., Liu, S., Ding, X., Zhu, B., Shi, J., Yang, B., Liu, S., Chen, W., & Tao, X. (2021). Permeable and washable electronics based on polyamide fibrous membrane for wearable applications. *Composites Science and Technology*, 207, 108729. <u>https://doi.org/10.1016/j.compscitech.2021.108729</u>.
- J70. Leung, M.S.H., Yick, K.L., Sun, Y., Chow, L., & Ng, S.P. (2022). 3D printed auxetic heel pads for patients with diabetic mellitus. *Computers in Biology and Medicine*, *146*, 105582.
- J71. Chow, L., Yick, K.L., Wong, K.H., Leung, M.S.H., Sun, Y., Kwan, M.Y., Ning, K., Yu, A., Yip, J., Chan, Y.F., & Ng, S.P. (2022). 3D Printing Auxetic Architectures for Hypertrophic Scar Therapy. *Macromolecular Materials and Engineering*, 307(5), 2100866.
- J72. Lau, Y.Y. (2022). A review of historical changes of tropical and extra-tropical cyclones: A comparative analysis of the United States, Europe, and Asia. *International Journal of Environmental Research and Public Health*.
- J73. Sum, C.K.M., Wong, S.M.H. and **Wut, T.M.E.** (2022). A study of continuance use intention of an on online learning system after Coronavirus disease 2019 pandemic outbreak. *Asia Pacific Journal of Education*.

- J74. Lau, Y.Y. and Wu, Y.A. (2022). A way forward for electric vehicle in Greater Bay Area: Challenges and opportunities for the 21st century. *Vehicles*.
- J75. Liang, S.J. (2022). Acoustic Luneburg lens based on a gradient metasurface for spoof surface acoustic waves. *JASA Express Letters*.
- J76. Ng, S.P.Z. (2022). Affective association with and preference for flexible brace colors in older adults with spinal deformities. *Color Research and Application*.
- J77. Lau, Y.Y. (2022). Blockchain and AI technology convergence: Applications in transportation systems. *Vehicular Communications*.
- J78. Lau, Y.Y. (2022). Borderline conditions for single or platooning operations in freight transport on expressways: Case study in Japan. *Frontiers in Future Transportation*
- J79. Lau, Y.Y. (2022). Chinese Cruisers' Preference, Travel Constraints, and Behavioural Intention: Experience from the Arctic Cruise Market. *Journal of Marine Science and Engineering*.
- J80. Liang, S.J. (2022). Chirality-switchable acoustic vortex emission via non-Hermitian selective excitation at an exceptional point. *Science Bulletin*.
- J81. Leung, C.W. and Zhang, H.F. (2022). Counter-crossflow indirect evaporative cooling-assisted liquid desiccant dehumidifier: Model development and parameter analysis. *Applied Thermal Engineering.*
- J82. Ng, S.Y.S. (2022). Critical Thinking Cognitive Skills and Their Associated Factors in Chinese Community College Students in Hong Kong. *Sustainability*.
- J83. Lau, Y.Y. (2022). Developing a resilience assessment model for critical infrastructures: The case of port in tackling the impacts posed by the Covid-19 pandemic. *Ocean and Coastal Management*.
- J84. Lee, S.W., **Wut, T.M.E.** and Xu, J.B. (2022). Does Gender Matter? Effect of Colleagues' Support on Work Engagement of Salespeople. *Sustainability (Switzerland)*.
- J85. Lee, S.W., **Wut, T.M.E.** and Xu, J.B. (2022). Does University Ranking Matter? Choosing a University in the Digital Era. *Education Sciences*.
- J86. Ng, M.L.P. and **Wut, T.M.E.** (2022). Drivers of corporate social responsibility and firm performance for sustainable development—An institutional theory approach. *Corporate Social Responsibility and Environmental Management*.
- J87. Lau, Y.Y. (2022). Dynamics of the Asian shipping network in adjacent ports: Comparative case studies of Shanghai-Ningbo and Hong Kong-Shenzhen. *Ocean & Coastal Management*.
- J88. Lam, W.M.E. (2022). Effectiveness and Advancements of Heritage Revitalizations on Community Planning: Case Studies in Hong Kong. *Buildings*.
- J89. **Zhang, H.F**. (2022). Effects of building setback on thermal comfort and air quality in the street canyon. *Building and Environment*.

- J90. Lau, Y.Y. and Wu, Y.A. (2022). Electric vehicle charging infrastructures in the Greater Bay Area of China: Progress, Challenges and Efforts. *Frontiers in Future Transportation*.
- J91. Chan, K.Y.J., Ng, M.L.P. and **Wut, T.M.E.** (2022). Enhancing perceived employability through work-integrated learning. *Education and Training*.
- J92. Liang, S.J. (2022). Enhancing ultrasound transmission and focusing through a stiff plate with inversely optimized auxiliary meta-lens. *Applied Physics Letters*.
- J93. Kahangamage, U. and Leung, C.W. (2022). Experimental Study of Lean-burning Limits of Hydrogen-enriched LPG Intended for Domestic Use. *Journal of Energy and Power Technology*.
- J94. Lau, Y.Y. (2022). Ferry services and the community development of peripheral island area in Hong Kong: Evidence from Cheung Chau. *Island Studies Journal*.
- J95. Ng, S.P.Z. (2022). Foot deformation analysis with different load-bearing conditions to enhance diabetic footwear designs. *PLoS ONE*.
- J96. Lau, Y.Y. (2022). Fundamental shifts of cruise shipping in the post-COVID-19 era. *Sustainability (Switzerland).*
- J97. Lau, Y.Y. (2022). Game Change: A Critical Review of Applicable Collision Avoidance Rules between Traditional and Autonomous Ships. *Journal of Marine Science and Engineering*.
- J98. Lau, Y.Y. (2022). Healthcare Supply Chain Management under COVID-19 Settings: The Existing Practices in Hong Kong and the United States. *Healthcare (Switzerland)*.
- J99. Liang, S.J. (2022). Hermitian and non-hermitian topological edge states in one-dimensional perturbative elastic metamaterials. *Mechanical Systems and Signal Processing*.
- J100. Lee, S.W., **Wut, T.M.E.** and Xu, J.B. (2022). How do Facilitating Conditions Influence Student-to-Student Interaction within an Online Learning Platform? A New Typology of the Serial Mediation Model. *Education Sciences*.
- J101. Lau, Y.Y. (2022). Impact of mobile learning in engineering mathematics under 4-year undergraduate curriculum. *Asia Pacific Journal of Education*.
- J102. Lau, Y.Y. (2022). Implementing Anti-money-laundering Goals: New Technologies or Coordination between Related Agencies? *Journal of China Tourism Research*.
- J103. Lee, S.M.D. and **Wut, T.M.E.** (2022). Increasing Seasonal Influenza Vaccination among University Students: A Systematic Review of Programs Using a Social Marketing Perspective. *International Journal of Environmental Research and Public Health*.
- J104. Ng, S.P.Z. (2022). Influence of Upper Footwear Material Properties on Foot Skin Temperature, Humidity and Perceived Comfort of Older Individuals. *International Journal of Environmental Research and Public Health*.

- J105. Lau, Y.Y. (2022). Integrated Smart Warehouse and Manufacturing Management with Demand Forecasting in Small-Scale Cyclical Industries. *Machines*.
- J106. Lau, Y.Y. and Wu, Y.A. (2022). Integration of Electric Vehicles into Microgrids: Policy Implication for the Industrial Application of Carbon Neutralisation in China. *World Electric Vehicle Journal*.
- J107. Liang, S.J. (2022). Observation of Non-Abelian Thouless Pump. Physical Review Letters.
- J108. Liang, S.J. (2022). Observation of non-Hermiticity-induced topological edge states in the continuum in a trimerized elastic lattice. *Physical Review B*.
- J109. Ng, M.L.P. and **Wut, T.M.E.** (2022). Perceived CSR motives, perceived CSR authenticity, and pro-environmental behavior intention: an internal stakeholder perspective. *Social Responsibility Journal*.
- J110. Lau, Y.Y. (2022). Perceptions and challenges of engineering and science transfer students from community college to university in a Chinese educational context. *Frontiers in Psychology*.
- J111. Lau, Y.Y. (2022). Rebuilding a more sustainable fashion industry after COVID-19. *HSUHK Business Review*.
- J112. Loh, W.K.A. and Mak, K.L.R. (2022). Relationship Between Road Traffic Exposure and Human Health. *European Journal of Environment and Earth Sciences*.
- J113. Lee, S.W., **Wut, T.M.E.** and Xu, J.B. (2022). Role of Organizational Resilience and Psychological Resilience in the Workplace—Internal Stakeholder Perspective. *International Journal of Environmental Research and Public Health.*
- J114. Liang, S.J. (2022). Second-order elastic topological insulator with valley-selective corner states. *International Journal of Mechanical Sciences*.
- J115. Lau, C.Y. and **Wut, T.M.E.** (2022). Share, Comment, and Like on Facebook and Message Strategies of Non-Governmental organizations. *SAGE Open*.
- J116. **Zhu, B.** (2022). Smart clothing with built-in soft sensing network for measuring temporal and spatial distribution of pressure under impact scenarios. *Advanced Sensor Research*.
- J117. Sum, C.K.M., **Wut, T.M.E.** and Xu, J.B. (2022). Staying local or going back: A study on international university graduates' mobility. *PLoS ONE*.
- J118. Chan, N.M.I., **Lau, Y.Y.** and Sum, C.K.M. (2022). The differences between students' fixed and growth mindsets: a case of study tour between Hong Kong and Canada. *Public Administration and Policy*.
- J119. Lau, Y.Y. (2022). The Drone Scheduling Problem: A Systematic State-of-the-Art Review. *IEEE Transactions on Intelligent Transportation Systems*.
- J120. Lau, Y.Y. (2022). The durability of economic indicators in container shipping demand: a case study of East Asia–US container transport. *Maritime Business Review*.

- J121. Lau, Y.Y. (2022). To buy or not to buy: How young consumers approach new smart products in the social media context. *Young Consumers*.
- J122. Lee, S.W., Ng, M.L.P., **Wut, T.M.E.** and Xu, J.B. (2022). Tourists Travel Behaviour After COVID-19. *Geojournal of Tourism and Geosites*.
- J123. Lee, S.W., Lee, S.M.D., **Wut, T.M.E**. and Xu, J.B. (2022). University Student Readiness and Its Effect on Intention to Participate in the Flipped Classroom Setting of Hybrid Learning. *Education Sciences*.
- J124. Lee, S.M.D., Ng, M.L.P. and **Wut, T.M.E**. (2022). Virtual reality in festivals: A systematic literature review and implications for consumer research. *Emerging Science Journal*.
- J125. Lee, S.W., **Wut, T.M.E.** and Xu, J.B. (2022). Work from Home Challenges of the Pandemic Era in Hong Kong: A Stimulus-Organism-Response Perspective. *International Journal of Environmental Research and Public Health*.

Journal (by RCADM	Impact Factor	
December 2015	Journal of Manufacturing Technology Management (Dr Z ALI)	7.547
	International Journal of Production Economics (Dr HL CHAN)	7.885
Contraction of the second of t	Journal of Engineering, Design and Technology (Dr J CHAN)	1.47
Cleaner Production	Journal of Cleaner Production (Dr WT HO)	9.297
	Transportation Research Part D: Transport and Environment (Dr YY LAU)	5.495

Journal Papers Published by RCADMM Members

Journal (by RCADMM Member)		Impact Factor
	Fuel (Prof CW LEUNG)	6.609
PHYSICAL REVIEW APPLIED A Collection from PRApplied Photovoltaic Energy Conversion	Physics Review Applied (Dr SJ LIANG)	4.985
sustainability	Sustainability (Dr S WONG)	3.251
Banchy st Matematica	Ricerche di Matematica (Dr WK LOH)	1.19
INTERNATIONAL JOURNAL OF BIOPRINTING	International Journal of Bioprinting (Dr SP NG)	6.638
	Environmental Science and Pollution Research (Dr HY TONG)	4.223

Journal Papers Published by RCADMM Members

Journal Papers	Published	by RCADMM	Members

Journal (by RCADMM Member)		Impact Factor
	Journal of Chemical Education (Dr CHS WONG)	2.979
RENERGY POLICY	Energy Policy (Dr Y WU)	6.142
Interactive Technology and Smart Education	Interactive Technology and Smart Education (Dr TM WUT)	1.98
	Building and Environment (Dr H ZHANG)	6.456
COMPOSITES SCIENCE AND TECHNOLOGY Materialstoday	Composites Science and Technology (Dr B ZHU)	8.528

<u>Appendix V(a) – Final year projects proposed and supervised by RCADMM Team</u> <u>Members (and Associate Team Members) in 2020-2022</u>

Project	Discipline	Supervisor	Student
2020/21			
Floor plan generation using 3D vision	Mechanical Engineering	Dr CHAU James	
Indoor point cloud generation using dual 360 cameras			
Study the control techniques for 3D object scanning platform	Electrical	C.P.	
Indoor patrolling robot	Engineering		
Design and build the test rig for investigation of performance characteristic of axial fan	Mechanical Engineering	Dr CHEN Cindy Y.	
Design and build the test rig for investigation of performance characteristic of centrifugal pump			
Development of an exercising device for wheelchair users			
A baby stroller that shields air pollutants from environment			
Development of an appropriate disaster relief device: portable water purification system	Mechanical Engineering	Dr Udaya KAHANGAMAGE	
Investigation of mechanical and fire performance of 3D-printed composite materials			
Study on propeller blade design for aeronautical applications			
Design and build the test rig to investigate heat enhancement by heat exchanger fin	Mechanical Engineering	Dr VYAS Anand	

(Total: 81 Final Year Projects Provided to BEM, EE and ME)

Project	Discipline	Supervisor	Student
Design and build the test rig for investigation of convection and radiation heat transfer	Mechanical Engineering	Dr VYAS Anand	
Effectiveness of Safe Working Cycle (SWC) on safety performance of RMAA works in Hong Kong Impact of pre-fabrication on productivity in the Hong Kong construction industry Efficiency of green building evaluation on building design of commercial building Evaluation of the effectiveness of construction waste management policies in Hong Kong Feasibilities and difficulties of modular integrated construction in Hong Kong	Building Engineering and Management	Dr LAM Edmond W.M.	
Statistical prediction model of compressive behavior of 3D printed cellular structures Investigation of noise barrier design for Hong Kong highway	Mechanical Engineering	Dr LOH Anthony W.K.	
Design of auxetic structures for compressive strength enhancement by Finite-Element Analysis Study of mechanical properties of plant fiber composites Effect of Plasma treatment on mechanical properties of natural fiber composites Aerodynamic performance of 3D-printed morphing airfoil	Mechanical Engineering	Dr NG Zerance S.P.	
Investigation of charging facilities technologies and payment systems for electric vehicles in Hong Kong Optimised mapping of locations for newly planned charging facilities of electric taxi in West Kowloon	Electrical Engineering	Dr WU Andrew Y.	

Project	Discipline	Supervisor	Student
Structural design of 3-DOF moving platform in spherical coordinate system	Mechanical Engineering	Dr LIANG Junot S.J.	·
2021/22			
Study on effect of neighbor noise to indoor sound quality	Mechanical Engineering	Dr LAM Coriolanus C.L.	
Development of sustainable domestic fuel: blended LPG/biogas	Mechanical Engineering	Prof LEUNG C.W.	
Design, build and analysis of a robotic jelly fish	Mechanical Engineering	Dr LIANG Junot S.J.	
Investigation on weak dispersion of air-conditioning exhaust heat in semi-shafts of buildings in Hong Kong	Mechanical Engineering	Dr ZHANG Flora H.	
Real time indoor air quality monitoring IoT device	Electrical Engineering	Dr CHAU James C.P.	
Eye controlled robotic arm	Electrical Engineering	Dr WONG K.C.	
Challenges and opportunities for achieving carbon neutralization in Hong Kong	Electrical Engineering	Dr WU Andrew Y.	
Optimum transmission network expansion planning	Electrical Engineering	Dr YU C.W.	
The popularity of green building in Hong Kong	Building Engineering	Dr LAM Edmond W.M.	

Project	Discipline	Supervisor	Student
An analysis of Hong Kong Construction Health and Safety in seek to minimize site accidents in Hong Kong	and Management		
Challenges of sustainable urban development in Hong Kong	Building Engineering	Dr WONG Kelwin	
sustainability	Management	К . W.	
How Augmented Reality benefit construction industry	Building Engineering	Dr KONG Stephen	
BIM is the future for enhancing project efficiency	and Management	C.W.	
2022/23			
Point of Interest (PoI) measurement using dual 360 cameras	Mechanical Engineering		
Automated shopping cart in indoor environment			
Fall detection IoT device		Dr CHAU James C.P.	
Intelligent indoor air quality monitoring IoT device			
A study of Point of Interests (POI) positioning with image analysis in indoor environment			
Autopliot shopping cart	Engineering		
Autopilot wheelchair			
Human pose analysis by thermal camera system			
Biogas for Domestic Heating	Mechanical	Prof LEUNG C W	
Mixed Convection of Vertical Heat Exchanger Fins on Vertical Base	Engineering	THE LETTE C.W.	

Project	Discipline	Supervisor	Student
Study on acoustics materials for buildings	Mechanical Engineering	Dr LAM Coriolanus C.L.	
Development of Plant Fibre Composites (PFC) with Enhanced Flame-Retardant Properties Effect of Plasma Treatment on Mechanical Properties of Plant Fibre			
Composites (NFC) Novel 3D Textiles Design for Sound Absorption Applications	Engineering	Dr NG Zerance S.P.	
Fit of N95 Respirators			
Numerical assessment of wind power potential and installation arrangement in high-rise buildings in Hong Kong Investigation on innovative ventilation systems for densely	Mechanical	Dr ZHANG Flora H	
occupied buildings in Hong Kong Design and manufacturing of bio-inspired Micro Aerial Vehicle (MAV)	Engineering	п.	
Mechanical & Corrosion properties of Ti-based coatings			
Mechanical and corrosive investigations of TiO ₂ coated NiTi alloys for bioapplications	Mechanical Engineering	Dr VYAS Anand	
Study of degradation behaviour of natural fiber composites			
Numerical Investigation of Combustion Characteristics of Hydrogen-enriched Low to Medium Calorific Value Landfill			
Investigation of Mechanical Performance of 3D-printed Polymer-metal Hybrid Materials	Mechanical Engineering	Dr Udaya KAHANGAMAGE	_
Development of an exercising device for wheelchair users			
Development and performance investigation of 3D printed injection moulds			

Project	Discipline	Supervisor	Student
Vertical dispersion model of road traffic-emitted particulate matters and noise	Mechanical Engineering	Dr LOH Anthony W.K.	
Design, build and analysis of a robotic jelly fish	Mechanical	Dr LIANG Junot S.J.	
Experimental investigation of tunable ventilated metamaterial sound barrier	Engineering		
Development of a power market in			
Selection and performance assessment of directional protection relays	Electrical Engineering	Dr YU C.W.	
Short-run power transmission marginal cost evaluation Stability Evaluation in Electrical Power Systems			
Topological study of potential locations for charging stations of private electric vehicles in East Kowloon Optimisation model of charging	Electrical Engineering	Dr WU Andrew Y.	
cross-border routines in Hong Kong and Greater Bay Area			
Impact of BIM Implementation on Building Construction & Design Management: A case study of Hong Kong Effectiveness of Modular Integrated Construction in the Hong Kong construction industry Potential of Using Internet of Things (IoT) in construction site management Feasibility of the modular integrated	Building Engineering and Management	Dr LAM Edmond W.M.	
construction (MIC) in Hong Kong Private Residential Projects			
Discovering the Underground Condition: How can BIM help design the foundation in construction engineering Construction Safety Management and Effectiveness in Hong Kong	Building Engineering and Management	Dr WONG Kelwin K.W.	

<u>Appendix V(b.1) – New experiments (with acquisition of equipment/instruments and enhancement of Laboratories) developed by RCADMM to support teaching (laboratory work) and research (experimental investigation)</u>

Experiment	Equipment/ Instruments Acquired
2020	
 High-Resolution Universal Data Logger Function: To measure force, strain, and temperature. > Use strain gauges, thermocouples, TEDS > Resolution of 0.1 μm/m > 10 channels > Fast sampling time > Large storage capacity 	
 Long Travel Axial Extensometer Function: To measure highly extensible materials. > Test Standard: ASTM E 83 and ISO 9513 > Gauge length: 5 – 50mm > Accuracy grade @ 0.5 	
 <u>Surface Roughness Tester</u> Function: To measure surface roughness. > Range: 5 – 100 μm > Stylus tip radius: 2 μm > Provide local roughness and the roughness profile 	

Experiment	Equipment/ Instruments Acquired
 Thermal Imaging Camera Function: To measure temperature field of prototype. > Error < 2% > Large image storage > Can work with computer 	
 Non-contact IR/Laser Thermometer Function: To measure local temperatures without contact. From - 30°C to 500°C Error < 1% Maximum distance/spot ratio: @ 10 	
 <u>3-D Scanner</u> Function: Gathering, presenting, and analyzing 3-D data. > Work with 3-D printer > As good as CAD quality > Scanning of original object Scanning of prototype for further processing in CAD data 	EinScan-SP

Experiment	Equipment/ Instruments Acquired
<u>Argon Plasma jet machine</u> Function: To alter the surface properties of a material by ionized argon gas.	
<u>Hydraulic hot press machine</u> Function: To fabricate composite materials under designated pressure and temperature.	
<u>Infusion system</u> Function: To fabricate composite materials according to the mold shape by infusion of resin material.	

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Laboratory injection molding machine

Function: To produce injection moulded polymer material samples for material characterisation





Universal Testing machine

Function: To perform tensile, bending and compression tests for material characterization

<u>Non-dispersive infrared (NDIR) multi-gas</u> <u>analyzer</u>

Function: Flue gas analysis in combustion related experiments



Experiment

Equipment/ Instruments Acquired



Function: Stereo microscope platform for materials science applications



2021

<u>Construction and Control of Unmanned</u> <u>Aerial Vehicle (UAV)</u>

The experiment is designed for Building, Electrical and Mechanical Engineering degree programmes and will be conducted in the newly developed <u>Acoustics and Robotics</u> <u>Laboratory (HHB UG11)</u>.*

Objectives:

- 1. To study the fundamental construction and the essential components of an UAV.
- 2. To learn the control technique of an UAV through practice.
- 3. To explore the important factors in the control of an UAV.

Construction and Control of Robotic Arm

The experiment is designed for Building, Electrical and Mechanical Engineering degree programmes and will be conducted in the newly developed <u>Electric Vehicles and</u> <u>Electrical Engineering Laboratory (HHB</u> <u>801)</u>.*





Experiment

Equipment/ Instruments Acquired

Objectives:

- 1. To study the fundamental construction and the essential components of a robotic arm.
- 2. To learn the control technique of a robotic arm through practice.
- 3. To explore the important factors in the control of a robotic arm.



* The Acoustics/Robotics and Electric Vehicles/Electrical Engineering Laboratories are developed to support teaching the engineering programmes and research works of the RCADMM of SPEED

Studies of Smart Grid

The experiment is designed for Electrical and Mechanical Engineering degree programmes and will be conducted in the newly developed <u>Electric Vehicles and Electrical Engineering</u> <u>Laboratory (HHB 801)</u>.*

Through the application of a model to achieve the following objectives:

- 1. To study the various operation natures of a Smart Grid.
- 2. To study the advanced metering infrastructure and distribution boards using in the Smart Grid.
- 3. To study the integration between the smart distribution board with domestic circuit.

<u>Studies of Charging Method and Efficiency</u> <u>of Electric Vehicle Battery</u>

The experiment is designed for Electrical and Mechanical Engineering degree programmes and will be conducted in the newly developed

Electric Vehicles and Electrical

Engineering Laboratory (HHB 801)*.

Through the application of a model to achieve the following objectives:

1. To study the fundamental construction and working principle of an Electric Vehicle



A Model Applying to Demonstrate the Smart Gid Concept



A Model Applying to Demonstrate the Charging of Electric Vehicle Battery

Experiment	Equipment/ Instruments Acquired
 Battery. 2. To study the charging of an Electric Vehicle Battery from the electricity network. 3. To study the effects of various important parameters on the Charging Efficiency. 	CORDED TESLA CHARGING

* The Electric Vehicles and Electrical Engineering Laboratory is developed to support teaching of the engineering programmes and research works of the RCADMM of SPEED

<u>Flammability Limits of Hydrocarbon Fuel</u> <u>Blended with Hydrogen</u>

The experiment is designed for Building and Mechanical Engineering degree programmes and will be conducted in the newly developed

Energy Conversion and Utilisation Laboratory (HHB 1306).*

Objectives:

- 1. To study the combustion characteristics of the blended methane/hydrogen gaseous fuel in relation to its Flammability Limits.
- To study the effects of Reynolds Number and Equivalence Ratio on the Flammability Limits.
- 3. To compare the theoretical predictions with the experimental observations.

Application of Building Information Modelling (BIM) Technique

The experiment is designed for Building, Electrical and Mechanical Engineering degree programmes and will be conducted in the

Information Technology Laboratory (HHB 1208). *

Students should have fundamental knowledge about the Building Information Modelling



Test Rig for Experiments on Flame Stability



Experiment	Equipment/ Instruments Acquired
 (BIM) technique before attending this laboratory class. Through the application of the BIM technique, the students are expected to achieve the following objectives: 1. To study the interior contents of a room under consideration. 2. To develop the model of the room with BIM technique under supervision. 	
* Energy Conversion and Utilisation Laboratory and Information Technology Laboratory are developed to support teaching of the engineering programmes and research works of the RCADMM of SPEED	

<u>Appendix V(b.2) – Subject Description Form of the new engineering design subject,</u> <u>SEHS3330 Designing Technical Solutions, developed with assistance of RCADMM and will be</u> <u>offered in September 2023</u>

School of Professional Education and Executive Development

Subject Code	SEHS3330
Subject Title	Designing Technical Solutions for the Community
Credit Value	3
Level	3
Medium of Instruction	English
Pre-requisite/ Co-requisite/ Exclusion	Nil This subject is for students enrolled in the following PolyU-SPEED award programmes and to fulfil the Service-Learning Requirement: BEng (Hons) in Mechanical Engineering; BEng (Hons) in Electrical
	Engineering; BSc (Hons) in Building Engineering and Management; BSc (Hons) in Property and Asset Management; BSc (Hons) in Surveying: BSc (Hons) in Applied Science.
Prior Knowledge	Nil
Objectives	This subject aims to equip students with concept and practices of service-learning along with technical skills and ability to design/re-engineer support devices that can cater to the service recipients' needs, additionally, nurturing students' empathy and civic responsibility. The service component of this subject aims to identify the unfulfilled needs of the underserved elderly and disabled people, and develop customised design solutions for them. This subject will help enhance students' awareness of community care and gain competencies while working in a multi-disciplinary project team.
Intended Learning Outcomes	Upon completion of the subject, students will be able to:
	 (a) apply the design and project management skills to dealing with complex issues in the service setting;
	(b) reflect on their role and responsibilities on both as a professional in their chosen discipline and as a responsible citizen;
	(c) demonstrate empathy for the people in need and a strong sense of civic responsibility;
	 (d) apply design thinking and project management skills to designing and implementing appropriate technical design solutions for identified needs/problems of the target community group; and

Subject Description Form

	 (e) collaborate effectively with different stakeholders including service recipients, social workers, technical personnel and peers coming from different disciplines of study.
Subject Synopsis/ Indicative Syllabus	This subject is designed to extend students' discipline-specific skills as well as to emphasize the importance of community services and civic responsibility, particularly for the underserved elderly and physically disabled people.
	Concept and Practice of Service-Learning (based on the e-Learning module provided by Service-Learning and Leadership Office of PolyU)
	Principles, concepts and myths of service-learning; Benefits of service-learning to students and the community; Ethical issues in service-learning; Role and responsibilities in service-learning; Appropriate attitudes and behaviours in service delivery; Reflection as a tool for learning.
	Discipline-specific Concepts, Issues and Skills
	Use of design thinking process for development of appropriate technical design solutions for products (by following the five steps of design thinking: Empathise, Define, Ideate, Prototype and Test); Proper use of visualization and communication tools including computer assisted technologies; Product re-engineering and fabrication using basic manufacturing techniques; Need for developing total system solutions by considering user needs, repair and maintenance, human factors, safety, reliability, economic aspects, etc.; Tailor-made products for the underserved elderly and physically disabled people) as a means to enhance civic engagement and develop a sense of social commitment and responsibility.
	Project-Specific Concepts, Issues and Skills Youth awareness and involvement in the ongoing social, psychological, and economic issues experienced by target beneficiaries; Link technical knowledge to serving underserved community needs; Art of communication with the underserved elderly and physically disabled people to identify real needs and get appropriate feedback for solution development; Development of solutions, with regards to constraints such as finance, time, space, manpower, special cultural or socio-economic concerns; Effective teamwork, problem-solving skills, and project management skills in Service-Learning projects.
Teaching/ Learning Methodology	This subject is designed to be completed within one semester. The following teaching and learning methodologies are used to achieve its objectives:

e-Learning Module (10 hours)

e-Learning module consists of readings, exercises and assessments that are designed to introduce students to the basic concept and practice of service-learning. Students are required to successfully complete the e-Learning module within the first four weeks of the semester.

Discipline-Specific Lectures, and Workshops (9 hours)

These lectures and workshops are designed and conducted by the teaching team on the design thinking, visualization and communication techniques as applied to product design and development, safety and human factors in product design/re-engineering of existing products, common technologies and materials available, prototyping techniques, use of fabrication tools, project management techniques, etc.

Project-Specific Seminars (6 hours)

The seminars are delivered by invited guest speakers from the service partners to educate students on the target community group(s), common problems faced by them, art of communication with different target groups, their responsibilities towards the society, respect for and commitment to serving others, etc.

Service-Learning Project (40 hours)

For the Service-Learning project, students will work in small groups of 4 to 5 members each. Each student group is introduced to a service recipient with a need that could be satisfied through technical solutions in product design. The student group then goes through a systematic process where they identify the service recipient's needs. Next, they are required to conduct a marketresearch on the availability/non-availability as well as the affordability of the existing technical solutions in the market. Subsequently, to develop or modify concept solutions, test the selected concept, redesign/modify and finally deliver the product to the service recipient. During this experiential learning process, students will apply the tools and techniques learned from classroom lectures and workshops to developing effective technical design solution(s) to address the service recipients' needs.

The subject management team will work with selected service partners to reach out to the beneficiaries. The target beneficiaries of this subject are the underserved elderly living in elderly care homes or living alone in the community, physically disabled wheelchair users and those who are visually impaired. Several formal visits to the service recipients' site will be organized throughout the semester where students will be required to initiate, report on progress and deliver the developed solutions. Individual student groups can also organize several visits to the service recipient's site (to be formally endorsed by the subject lecturer) to understand and meet with the specific needs of their service recipients. While students are working at the service centre, a social worker will assist students during their interaction with the service recipients. These self-initiated visits help the students to develop skills and demonstrate commitment for community service and provide the subject lecturers with an opportunity to assess related learning outcomes of the students.

Breakdown of the 40-hour service component:

- 1. Three supervised site visits at the start, in the middle and at the end of the semester (18 - 24 hours). These visits are designed to be fully monitored by academic staff who will also provide students with the necessary guidance as and when required. The first visit will focus on rapport building, and initial observation and understanding of the service recipients. This includes talking with the caregivers of the service centre for students to get more ideas on how to interact with the service recipients, safety measures, etc. Then, students will interact with the service recipients to understand their specific needs. Students will step into the situation of the service recipients via hands-on experience to assess their actual and precise needs, e.g. by taking the necessary measurements. The second visit aims to discuss the initial solution concepts through visualized drawings or crude prototypes and collecting feedback. The objective of the third visit is to deliver and fine-tune the product, train the service recipients on using the product and collect feedback from them.
- 2. Student-initiated supervised visits are for further clarifying service recipients' needs, exploring and developing different options for product design solutions, concept testing, product testing and modification with the service recipient, installation, providing training to the service recipient on the usage and maintenance, and attending to any other needs of the service recipient (16 22 hours between Weeks 3 and 13). During the site visits, students will use their own judgement to continue on their service projects and consult the subject lecturer and the service partner for advice. Students will be required to maintain a detailed logbook reflecting on their tasks performed. This will be formally evaluated according to an assessment rubric. Some student helpers (appointed from senior year) will monitor and assist
| | them as required d | luring the visits | | | | | | |
|--|--|---|-------------------------|---|------------------------|----------------------|---|------------------------|
| | Consultations and Discussions (12 hours) | | | | | | | |
| | Student groups get the opportunity of discussing with the teaching
team members to clarify issues related to the service project.
Necessary advice and guidance will be provided during these
consultation sessions to better prepare students for the service and
to align their work towards providing effective service. It also
provides an opportunity for the teaching staff to check and verify
the students' interactions with the service recipient, social workers
and caregivers, and the logbook entries. | | | | | | | |
| | On top of the above form
to arrange informal com
assigned teaching staff m | nal consultatio
isultation sessi
ember (subject | n sei
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ct. |
| Assessment
Methods in
Alignment with | A variety of assessment students' achievement of | tools will be
the subject inte | used
ende | l to
d lea | dev
arnir | elop
1g ou | and | assess
es. |
| Intended Learning
Outcomes | Specific assessment
methods/tasks | %
weighting | In
lean
be
tic | Intended subject
learning outcomes to
be assessed (Please
tick as appropriate) | | | | |
| | | | a | b | c | d | e | |
| | Continuous
Assessment | 100 | | | | | | |
| | 1. e-Learning Module
(Individual) | Pass/Fail | | ~ | | | | |
| | 2. In-class activities
on Project-specific
Seminars and
Workshops
(Individual) | 10 | ~ | ~ | | | | |
| | 3. Project Proposal
(Group) | 10 | ~ | ✓ | | ~ | ~ | |
| | 4. Oral Presentation
(Group/Individual) | 10
(Individual)
/10 (Group) | | | ~ | ~ | ~ | |
| | 5. Reflective Journal (Individual) | 20 | ~ | ~ | ~ | ~ | | |
| | 6. Performance in
Rendering Service
(Group/Individual) | 20
(Individual)
/
20 (Group) | ~ | ~ | | ~ | ~ | l |
| | Total | 100 | | | | | | |

	To pass this subject, students are required to a above and pass the e-Learning Module in Assessment.	obtain Grade D or n the Continuous
	The e-Learning module includes online le assessment components that are designed to students' understanding of service-learning, th responsibility, and their role and responsibilities i	arning tasks and assess individual eir sense of civic in society.
	In-class activities on project-specific seminar expect students to be able to demonstrate the und role and responsibilities in society via a work specific quiz at the end of each session.	rs and workshops derstanding of their tshop and seminar
	Project proposal assesses the students' collaboratively to understand the problem(s) fa community and design an appropriate solut problem(s). It also assesses the students' underst between their profession and the service they are The project proposal will be assessed as a teamwork.	ability to work aced by the target tion to solve the tanding of the link e going to provide. ork.
	Oral presentation helps to assess individual st and understanding of discipline-specific concep engagement with the project activities. Group as the students' team spirit and leadership skills vi and group effort.	udents' knowledge ts and the level of sessment measures a group interaction
	In the reflective journal, each student is requisively his/her understanding about the problems experies community, the experience in participating in the project, and their own internal change. This is a use to what extent the student has demonstrated empirin need, and the development of his/her sense of the sense	nired to reflect on enced by the target his service-learning useful tool to assess bathy for the people civic responsibility.
	The performance of each project group and indivi- community service project is assessed by the tea direct observations and with the use of the feed service recipients and social workers of the necessary. Peer assessment is also adopted to diffi- contributions to each important project task.	idual students in the aching team through back solicited from service partners as ferentiate individual
Student Study	Class contact	Hours
Effort Expected	Lectures and Workshops	9
	Project-Specific Seminars	6
	Consultations and Discussions	12
	e-Learning Module	10

	Other student study effort		
	• Direct rendering of service, including meeting and interaction with service recipients to understand their needs, to obtain their feedback about the solution(s) developed, testing, improvement, solution delivery and training.	40	
	• Self-study	53	
	• Total student study effort	130	
Reading List and References	 Recommended Textbook There is no prescribed textbook for this subject include materials from the Internet and/or of libraries. References Cress C.M. (2013). Learning Through Set. Guidebook for Service-Learning and Civic E Academic Disciplines and Cultural Communiti Publishing. Dym C.L., Little P. and Orwin E.J. (2013). Engin Project-Based Introduction (4th ed). John Wiley. Ling D. (2016). Complete Design Thinking Gat Professionals. Emerge Creatives Group. Service-Learning Handbook (2020). Servit Leadership Office, The Hong Kong Polytechnic U Ulrich, K. T., Eppinger, S. D., & Yang, M. C design and development (7th ed.). McGraw-Hill E Journals Education, Citizenship, and Social Justice. The International Journal of Research on Se Community Engagement. 	ect. Readings can her materials from rving: A Student ingagement Across es (2 nd ed). Stylus meering Design – A uide for Successful ice-Learning and University. C. (2020). Product Education.	
	Journal of Experiential Education.		
	The Reading List and References are indicative materials will be suggested and assigned from they are deemed appropriate.	e. Relevant reading time-to-time when	

5.4 Please attach photo(s) of acknowledgement of RGC-funded activities / facilities / equipment.

Conferences

1. Conference on Advanced Materials & Industry 4.0 Conference (AMI 4.0)

Refer to Appendix II(b.1) on pages 42-43.

2. Conference on Advanced Materials and Processing Technologies (AMPT)

Refer to Appendix II(b.2) on pages 53-54.

3. International Conference on Advances in Design, Materials and Manufacturing Technologies 2022 (ICADMMT 2022)

Refer to Appendix II(b.3) on pages 62-63.

Seminars 8 1

29/4/2020: Roadmap for research development and recent technology in computer vision



29/6/2020: Advanced development in AI, materials, and manufacturing technologies



25/9/2020: Advanced engineering design, material enhancement and financial policy for



IDS(R)8 (Oct 2019)

All are welcome!

Please click here or scan the QR code for registration For enquiry, please contact Ms Jenny Li at Jenny, li a speed-polyu.edu.hk on or before 6 Jam

ary 2021



18/6/2021: Enhancement of materials properties by Plasma Treatment, Nanomaterials and Meta-structure



For enquiry, please contact Ms Jenny Li at jenny.li@speed-polyu.edu.hk on or before 16 June 2021.

15/11/2021: Preparation for the submission of research proposals to FDS in 2022



8/8/2022: Advanced technologies and materials for manufacturing industries



Senior Scientist, Columbia University Chief Executive Officer, Xylon Semiconductor Consultant to many IC companies like Texas Instrument, Intel, Broadcom, Qualcomm, LSI Logics, Infinite Technologies, AMI Semiconductor etc.



Topic portunities and Skill sets requirement for IC Industries

Abstract

Job Opportunities and skill sets requirement for IC industries **Abstract** The global integrated circuit market size is projected to grow from 490 billion USD in 2021 to 173 billion in 2028, more than 2 times in 7 years. Smart phone sepecially 56 connectivity, Advanced Driver Assistance System (ADAS) in automotive vehicles, cloud computing, IoT-based devices are anticipated to drive the market growth. Additionally, the development of novel technologies like Artificial Intelligence and high-end cellphones and compact electronics devices are expect to fuel further market growth. This treendous growth has created significant man power shortage worldwide. The projected manpower shortage in China is over 500,000 by 2022 and significant more in coming years because the growth of the market outpaced growth of manpower training. This manpower shortage is giving Hong Kong a great opportunity to provide high pay, high skill lobs for the coming new generation of young people. There are many areas of job opportunity in C industries that require different levels of skill set for people with background from high school educated to post-doctoral advanced level and many levels in between. The content of this talk is on the many different skill sets and their education level requirement for the IC design side and not on the IC fabrication side. It is this design side that will provide majority of the new job opportunity.

Topic

Dr Zerance NG Associate Division Head, SEHS, PolyU CPCE

Composites with Improved Fire-retardant Property using Micro size Graphene Oxide Particles



Abstract Fiber-reinforced polymer composites (FRPCs) have been used tremendously in various engineering applications, such as medical equipment, civil infrastructure, automobiles, aircrafts, aerospace, sporting goods and consumer products etc. The embedded fiber material contributes to the large portion of mechanical support of the entire composite material while the resin material transfers the external loading to the fibers and also protects them from abrasion or damage. The advantages of using composites include high strength with light weight as well as outstanding fatigue and corrosion resistance when compared with metal alloys and concrete. However, most composites are flammable and hazardous to users in case of fire incidents. To overcome such problem, fire retardants are incorporated in the resin of composites. In this seminar, the working principle of fire retardants will be explained and a new fire retardant using micro-size graphene oxide (G0) particles will be introduced. Abstract

aquiry, please contact Ms Jenny Li at jenny,li a speed-polyn,edu,hk on or before 6 August 2022.

14/10/2022: Sharing session for the submission under FDS





For enquiry, please contact Mr Tommy NG (Tommy Ng@cpce-polyu.edu.hk).

18/11/2022: New trends in materials sustainability in textile industry



Workshops

25/9/2020: Computer Workshop - CAD with SOLIDWORKS

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學 COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院 SPEED



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Computer Workshop – CAD with SOLIDWORKS



9/10/2020: Computer Workshop - CFD Application with FLUENT



COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Computer Workshop – CFD Application with FLUENT

Speaker: Dr Flora ZHANG

Lecturer Division of Science, Engineering and Health Studies CPCE

> DATE: 9 October 2020 (Friday) TIME: 2:30 pm – 4:00 pm VENUE: Online (MS Teams)



The workshop is fully supported by a grant from the Research Grants Council of the HKSAR, China (Project No.: UGC/IDS(R)24/19)



14/10/2020: Computer Workshop - 3D Printing and Prototyping



COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專案及持續教育學院



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Computer Workshop – 3D Printing and Prototyping



Speaker: Dr Zerance NG Associate Division Head Division of Science, Engineering and Health Studies CPCE DATE: 14 October 2020 (Wednesday) TIME: 2:30 pm - 4:00 pm VENUE: Online (MS Teams)

the Research Grants Council of the HKSAR, China (Project No.: UGC/IDS(R)24/19)

SPEED

23/11/2020: Computer Workshop - 3D Printing and Prototyping

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學 COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Computer Workshop – 3-D Printing and Prototyping



Speaker: Dr Zerance NG Associate Division Head Division of Science, Engineering and Health Studies CPCE

> DATE: 23 November 2020 (Monday) TIME: 2:30 pm - 4:00 pm VENUE: Online (MS Teams)

The workshop is fully supported by a grant from the Research Grants Council of the HKSAR, China (Project No.: UGC/IDS(R)24/19)

24/11/2020: Computer Workshop - 3D Printing and Prototyping



COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Computer Workshop – 3-D Printing and Prototyping



12 & 14/1/2021: Fundamental 3D Printing: Start from TinkerCAD

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學 COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



SPEED

Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Fundamental 3D Printing: Start from TinkerCAD



Speaker: Dr Devil YIP Information Technology Officer CPCE Information Technology Unit CPCE

DATE: 12 & 14 January 2021 (Tuesday & Thursday) TIME: 4:30 pm - 6:00 pm VENUE: HHB-1208

The workshop is fully supported by a grant from



the Research Grants Council of the HKSAR, China (Project No.: UGC/IDS(R)24/19)

19 & 21/1/2021: Fundamental 3D Printing: Start from TinkerCAD



COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Fundamental 3D Printing: Start from TinkerCAD



Speaker: Dr Devil YIP Information Technology Officer CPCE Information Technology Unit CPCE

DATE: 19 & 21 January 2021 (Tuesday & Thursday) TIME: 4:30 pm - 6:00 pm VENUE: HHB-1208

The workshop is fully supported by a grant from



the Research Grants Council of the HKSAR, China (Project No.: UGC/IDS(R)24/19)

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SPEED

11/6/2021: Fundamental IoT Workshop

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學 COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Fundamental IoT Workshop



Speaker: Dr James CHAU Associate Division Head Division of Science, Engineering and Health Studies CPCE

> DATE: 11 June 2022 (Friday) TIME: 9:30 am – 5:30 pm VENUE: HHB-1208

The workshop is fully supported by a grant from the Research Grants Council of the HKSAR, China (Project No.: UGC/DS(R)24/19)

6/8/2021: Technique on measuring elongation of Elastomers



COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



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Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Techniques on Measuring Elongation of Elastomers



Speaker: Mr Anthony Poon General Manager Keao Ltd.

DATE: 6 August 2022 (Saturday) TIME: 9:30 am - 11:30 am VENUE: HHB-1208

The workshop is fully supported by a grant from



the Research Grants Council of the HKSAR, China (Project No.: UGC/IDS(R)24/19)

13/8/2021: 3D Scanning Workshop

The Hong Kong Polytechnic University 香港理工大學

COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Computer Workshop c - CFD Application with FLUENT



Speaker: Dr Coriolanus Lam Lecturer Division of Science, Engineering and Health Studies CPCE

> DATE: 13 August 2021 (Friday) TIME: 2:30 pm - 4:00 pm VENUE: HHB-1208

(E) The workshop is fully supported by a grant from the Research Grants Council of the HKSAR, China (Project No.: UGC/IDS(R)24/19)

20/8/2021: Workshop on preparation for FDS proposal



COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Workshop on Preparation for FDS Proposal



31/12/2021: CNC (Computer Numerical Control) Milling Machine Workshop

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學 COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



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Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop CNC (Computer Numerical Control) Milling Machine Workshop



Speaker: Dr KC WONG & Mr Max MAN Senior Lecturer & Technical Officer Division of Science, Engineering and Health Studies_

CPCE

DATE: 31 December 2021 (Friday) TIME: 3:30 pm - 6:00 pm VENUE: HHB-1208

(IĢ The workshop is fully supported by a grant from the Research Grants Council of the HKSAR, China (Project No.: UGC/IDS(R)24/19)

21/1/2022: Fundamental IoT Workshop



COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Fundamental IoT Workshop



Speaker: Dr James CHAU Associate Division Head Division of Science, Engineering and Health Studies. CPCE DATE: 21 January 2022 (Friday) TIME: 9:30 am - 5:30 pm VENUE: HHB-1209 The workshop is fully supported by a grant from

the Research Grants Council of the HKSAR, China (Project No.: UGC/IDS(R)24/19)

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19/4/2022: The 3D Printing Workshop

FHE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院



Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop The 3D Printing Workshop



Speaker: Dr Zerance NG Associate Division Head Division of Science, Engineering and Health Studies CPCE

> DATE: 19 April 2022 (Tuesday) TIME: 2:30 pm - 4:00 pm VENUE: Online (MS Teams)

The workshop is fully supported by a grant from the Research Grants Council of the HKSAR, China (Project No.: UGC/IDS(R)24/19) 28/6/2022: Artificial Intelligence Applications for Industry 4.0



For enquiries, please contact Ms Jenny LI at jenny.li@speed-polyu.edu.hk.

29/7/2022: The 3D Scanning Workshop



29/8/2022: CNC (Computer Numerical Control) Milling Machine Workshop



10/11/2022: Preparing a SolidWorks Model for 3D Printing Workshop



COLLEGE OF PROFESSIONAL AND CONTINUING EDUCATION 專業及持續教育學院





Research Centre for Advanced Design, Materials and Manufacturing Technologies

Research Workshop Preparing a SolidWorks Model for 3D Printing



Speaker: Dr Jess CHAN Lecturer Division of Science, Engineering and Health Studies CPCE

> DATE: 10 November 2022 (Thursday) TIME: 9:30 am - 12:00 noon VENUE: HHB-1209

The workshop is fully supported by a grant from



IDS(R)8 (Oct 2019)

Equipment











IDS(R)8 (Oct 2019)



6. Research Outputs

- 6.1 What are the accomplishments of the project?
 - (i) Please provide reports on conference, seminar, workshop, exchange programmes or other activities held (if applicable).
 (Please provide details of the activities organized, including the theme / objectives of the activities, targeted participants, attendance, analysis of participants, e.g. country of origin, research background, etc., evaluation forms of the activities and a summary of the participants' evaluation. Photos of the activities are preferred.)

Conferences (refer to Appendix II(b.1) on pages 42-52, Appendix II(b.2) on pages 53-61, and Appendix II(b.3) on pages 62-83)

(1) Conference on Advanced Materials and Industry 4.0 (AMI 4.0)

The 1-day Regional Conference with 14 presentations had been successfully held on 11 August 2021 at PolyU HHB Campus. There were 138 participants from industrial and commercial sectors, and universities (including PolyU) attending the conference (including 73% on site and 27% online) (details are referring to Appendix II(b.1) on pages 42-52).

(2) Conference on Advanced Materials and Processing Technologies (AMPT)

The 1-day Regional Conference with 11 presentations had been successfully held on 7 January 2022 at PolyU HHB Campus. There were 118 participants from industrial and commercial sectors, an d universities (including PolyU) attending the conference (including 72% on-site and 28% online) (details are referring to Appendix II(b.2) on pages 53-61).

(3) International Conference on Advances in Design, Materials and Manufacturing Technologies 2022 (ICADMMT 2022)

The 2-day International Conference with 35 presentations had been successfully held on 6 and 7 October 2022 at Hotel ICON and PolyU HHB Campus respectively. There were 198 participants from industrial and commercial sectors, and universities (including PolyU) attending the conference (including 72% on-site and 28% online) (details are referring to Appendix II(b.3) on pages 62-83).

Seminars (refer to Appendix II(a.1), pages 36-38)

There were 11 Technical Seminars offered:

- (1) 29/4/2020: Roadmap for research development and recent technology in computer vision 3 presentations (46 participants)
- (2) 29/6/2020: Advanced development in AI, materials, and manufacturing technologies 3 presentations (60 participants)
- (3) 25/9/2020: Advanced engineering design, material enhancement and financial policy for Industry 4.0 4 presentations (55 participants)
- (4) 8/1/2021: Advanced design of robotic and thermal systems 3 presentations (46 participants)
- (5) 19/3/2021: Advanced materials with superior properties: Mesophase Pitch, Nanocomposites and Meta-materials - 3 presentations (43 participants)
- (6) 18/6/2021: Enhancement of materials properties by Plasma Treatment,

Nanomaterials and Meta-structure - 3 presentations (48 participants)

- (7) 15/11/2021: Preparation for the submission of research proposals to FDS in 2022 (30 participants)
- (8) 4/3/2022: Hong Kong Advanced manufacturing technologies for composite materials 2 presentations (73 participants)
- (9) 8/8/ 2022: Advanced technologies and materials for manufacturing industries
 3 presentations (48 participants)
- (10) 14/10/2022: Sharing session for the submission under FDS 3 presentations (36 participants)
- (11) 18/11/2022: New trends in materials sustainability in textile industry 3 presentations (53 participants)

Workshops (refer to Appendix II(a.2), pages 39-40)

There were 19 Technical Workshops offered:

- (1) 25/9/2020: Computer Workshop CAD with SOLIDWORKS (15 participants)
- (2) 9/10/2020: Computer Workshop CFD Application with FLUENT (15 participants)
- (3) 14/10/2020: Computer Workshop 3D Printing and Prototyping (15 participants)
- (4) 23/11/2020: Computer Workshop 3D Printing and Prototyping (15 participants)
- (5) 24/11/2020: Computer Workshop 3D Printing and Prototyping (15 participants)
- (6) 12 & 14/1/2021: Fundamental 3D Printing: Start from TinkerCAD onsite F2F (25 participants)
- (7) 19 & 21/1/2021: Fundamental 3D Printing: Start from TinkerCAD onsite F2F (25 participants)
- (8) 11/6/2021: Fundamental IoT Workshop onsite F2F (25 participants)
- (9) 6/8/2021: Technique on measuring elongation of Elastomers onsite F2F (25 participants)
- (10) 13/8/2021: 3D Scanning Workshop onsite F2F (20 participants)
- (11) 20/8/2021: Workshop on preparation for FDS proposal onsite F2F + online (54 participants)
- (12) 31/12/2021: CNC (Computer Numerical Control) Milling Machine Workshop
 onsite F2F (20 participants)
- (13) 21/1/2022: Fundamental IoT Workshop (22 participants)
- (14) 19/4/2022: The 3D Printing Workshop (14 participants)
- (15) 28/6/2022: Artificial Intelligence Applications for Industry 4.0 (26 participants)
- (16) 19/7/2022: CAVE (Cave Automatic Virtual Environment) (20 participants)
- (17) 29/7/2022: The 3D Scanning Workshop (18 participants)
- (18) 29/8/2022: CNC (Computer Numerical Control) Milling Machine Workshop (22 participants)
- (19) 10/11/2022: Preparing a SolidWorks Model for 3D Printing Workshop (19 participants)
- (ii) Please provide reports on asset purchase such as acquisition of research facilities, communal equipment, software licence, dataset and / or status of infrastructure / physical research structure building such as research centre, research supporting unit (if applicable).

(Please provide supporting documents and / or photos, and provide the utilization

rate.)

Establish the Research Centre for Advanced Design, Materials and Manufacturing Technologies (RCADMM in PolyU SPEED refer to Section 2, Pages 1-7):

RCADMM is established since January 2020 with its office located in Room 1408 of the West Kowloon Campus of PolyU SPEED. RCADMM's administrative structure is presented in Section 2 (Pages 1-7). Operation and development of the RCADMM is fully responsible by the RCADMM Committee with full assistant from its three Sub-committees: Laboratory Development Seminar/ Conference Organization and Research Personnel/ Student. The 25 Members and Associate Members are research active academic staff of CPCE. Each Member is contributing significant effort to facilitate healthy operation and development of RCADMM.

Develop the Energy Conversion and Utilisation, Acoustics and Robotics Laboratory, Electric Vehicles and Electrical Engineering Laboratories in PolyU SPEED (refer to Attachment to Appendix I, Pages 33-35):

The Energy Conversion and Utilisation Laboratory, Acoustics and Robotics Laboratory, and Electric Vehicles and Electrical Engineering Laboratory have been developed in Rooms 1306, UG11, and 801 of the Hung Hom Bay Campus of PolyU SPEED since September 2021. They are built to facilitate performing of the research works of the RCADMM, as well as the teaching of engineering programmes of PolyU SPEED.

Acquire the equipment and instruments to support RCADMM's research works (refer to Appendix V(b.1), Pages 116-123):

The equipment and instruments required by the experimental investigation s of the research projects performing by the RC ADMM Members are acquired via purchasing and fabricating. Appendix V(b.1) on Pages 116-123 shows the equipment and instruments which have already been purchased.

Enhance the 3D Printing Facilities to support design work and offering workshops (refer to Appendix III, Pages 86-91):

PolyU CPCE has allocated resources to enhance the 3D printing facilities in the Hung Hom Bay Campus to support the design work including those conducting by the RCADMM Members The 3D scanner, non-contact thermometer, and thermal imaging camera have already been purchased to work with the 3D printing facilities. These facilities are also used to offer workshops to the industry and the SPEED staff and students.

Enhance the Computational Facilities to support simulation work and offering workshops (refer to Appendix II(c), Pages 84-85):

PolyU CPCE has allocated resources to enhance the necessary computational hardware and the CAD/CFD/BIM software of the three computer laboratories in the Hung Hom Bay Campus to support carrying out of the simulation work. The computational facilities are applying to support both teaching and research, as well as the offering of workshops /consultancy services to the industrial and commercial sectors, and the SPEED staff and students.

- (iii) Please provide reports on research activities carried out (if applicable).
- Propose research projects to obtain external/internal funding during the project period from 2020 to 2022 (refer to Appendix I, Pages 14-32):
 (Remark: The planned target is to propose 4 external funded projects and 4 internal funded projects per year.)

The RCADMM Members have submitted 22 research proposals to UGC/FDS and the following 10 projects have been funded:

- 1) Develop the most sustainable, safe, reliable and low-carbon domestic fuel for Hong Kong (UGC/FDS24/E02/19) by C. W. LEUNG
- 2) A low-cost autopilot system for built environment applications (UGC/FDS24/E02/20) by C. P. Chau
- 3) Development of plant fiber-reinforced polymer composites (PFRPCs) with enhanced mechanical and flame-retardant properties (UGC/FDS24/E07/20) by S. P. NG
- 4) Development of a Cloud-based System to facilitate End-User-Oriented (EOD) for effective sustainability practices implementation in high rise residential buildings (UGC/FDS24/E02/21) by W. M. LAM
- 5) Design and implementation of acoustic controlled ventilation louvre with metamaterial technology (UGC/FDS24/E04/21) by S. J. LIANG
- 6) Modelling of quantitative dynamic fit of respirators for healthcare workers (UGC/FDS24/E05/21) by S. P. NG
- A Machine Learning Model for recommendation system for Generic Competency Development in Higher Education (UGC/FDS24/E09/20 by C. H. SO
- 8) A novel real-time HVAC strategy based on lightweight CFD integrated with reinforcement learning for public transportation in Hong Kong (UGC/FDS24/E03/22) by H. ZHANG
- 9) Numerical and experimental investigation of the combustion and emission characteristics of low to medium calorific value landfill gas blended with hydrogen (UGC/FDS24/E11/22) by U. KAHANGAMAGE
- 10) Rebuilding port and resilient maritime supply chain networks in Asia (UGC/FDS24/B07/22) by Y. Y. LAU

The total funding obtained from FDS is \$7,544,227 and the successful rate is 45.5%.

The following RCADMM Members have submitted 21 research proposals to apply for the internal research fund and all have been funded:

- Development of web-based e-assessment tool and its integration with Moodle for effective oral presentation assessment and enhancing students' learning by U. KAHANGAMAGE
- 2) Enriching learning experience of construction and surveying students with capstone projects by W. M. LAM
- 3) Optimized integration of electric vehicles into local micro-grids: a comparative analysis between Hong Kong and Macao by Y. WU
- 4) Investigator of the thermal performance of a vertical tubular type indirect evaporative cooler by Y. CHEN
- 5) Study on metamaterials-based acoustic louvre by S. J. LIANG

- 6) Annoyance from transportation noise and health impact by K. L. MAK
- 7) Cognitive robotics: towards intelligent domestic service robots for the elderly by K. C. WONG
- 8) Anti-inflammatory and anti-bacterial properties of Tetrapanacis Medulla (TongCao) by H. H. CHAN
- 9) Pedagogic design of incorporating systems thinking in chemical education for a sustainable future by W. K. CHIU
- 10) Development of acoustics absorptive materials by 3D printing for indoor noise attenuation by C. L. LAM
- 11) Building resilient vaccine supply chain in the use of cloud-based blockchain by Y. Y. LAU
- 12) Examining the role of organizational resilience by T. M. WUT
- 13) University students' acceptance of Flipped classroom approach: perspective from theory of planned behaviour by T. M. WUT
- 14) Sustainable e-procurement adoption and practices in the pandemic era by S. M. YUEN
- 15) An exploratory and comparative study of the credit accumulation and transfer (CAT) policy and systems of implementation in higher education institutions in Hong Kong by K. M. TONG
- 16) Evaluation and optimization of mechanical properties of 3D metamaterials for energy absorption by B. ZHU
- 17) Achieving carbon neutralization based on the promotion of electric taxi a preliminary study using a multi-agent behavior model by Y. WU
- Dialogue act annotation of the spoken genres in the British National Corpus (BNC) with the ISO 24617-2 Standard by K. C. WONG
- 19) When do resilient employees become more engaged? by Y. Y. LAU
- 20) Factors affecting using Chatbot in customer services context using UTAUT2 model by T. M. WUT
- 21) Deposition and characterization of chromium based PVD coatings by A. VYAS

The total funding obtained from both FDS and internal funding is \$8,211,213. The internal funding is usually used as seeding money to prepare proposals for external funding.

Submission of Progress/Completion Reports for on-going external/internal funded research projects during the project period from 2020 to 2022:

For every external/internal funded project, the Principal Investigator is mandated to submit the progress/completion report to the funding institution according to the pre-determined schedule. The RCADMM Committee has regularly reminded the Members to ensure submission of the progress/completion reports at the right time. Chairman and Secretary of the RCADMM Committee are responsible to edit the reports to ensure quality.

Principal Investigators of the following FDS funded research projects are required to submit their progress reports in late 2021 and 2022 (the RCADMM Secretariat has provided them reminders):

- Develop the most sustainable, safe, reliable and low carbon domestic fuel for Hong Kong [UGC/FDS24/E02/19] – C. W. LEUNG (started in January 2020)
- A machine learning mode for recommendation system for generic competency development in higher education [UGC/FDS24/E09/20] C. H. SO (started in January 2021)

- A low-cost autopilot system for built environment applications [UGC/FDS24/E02/20] C. P. CHAU (started in January 2021)
- Development of plant fiber-reinforced polymer composites (PFRPCs) with enhanced mechanical and flame-retardant properties [UGC/FDS24/E07/20] S. P. NG (started in January 2021)

The following ten research projects have obtained the internal CPCE funding in 2020 and 2021, therefore the Principal Investigator of each project is required to submit the progress/completion report during project period from 2020 to 2022 (the RCADMM Secretariat has provided them reminders):

- Development of web-based e-assessment tool and its integration with Moodle for effective oral presentation assessment and enhancing students' learning U. KAHANGAMAGE (started in March 2020)
- Enrich learning experience of Construction and Surveying students with capstone projects W. M. LAM (started in March 2020)
- Optimized integration of electric vehicles into local Micro-Grid: Hong Kong and Macau Y. WU (started in June 2020)
- Annoyance from transportation noise and health impact K. L. MAK (started in November 2020)
- Cognitive robotics: towards intelligent domestic service robots for the elderly K. C. WONG (started in February 2021)
- Pedagogic design of incorporating systems thinking in chemical education for a sustainable future W. K. CHIU (started in April 2021)
- Development of acoustics absorptive materials by 3D printing for indoor noise attenuation C. L. LAM (started in April 2021)
- Building resilient vaccine supply chain in the use of cloud-based blockchain Y. Y. LAU (started in April 2021)
- When do resilient employees become more engaged? Examining the role of organizational resilience T. M. WUT (started in April 2021)
- Sustainable e-procurement adoption and practices in the pandemic era S. M. YUEN (started in April 2021)
- 6.2 Please describe where and how the IDS Research Infrastructure Grant project assisted in building up the research capacity of the institution in its strategic areas (e.g. has the IDS Research Infrastructure Grant project facilitated the academics in formulating their research proposals under the Faculty Development Scheme, etc.).

The Seminar/Conference Organization Sub-Committee has organized 11 research seminars, 19 technical workshops and 3 conferences (including 60 presentations) with the themes according to target strategic research areas during the project period from 2020 to 2022 (as stated in section 6.1(i)). The strategic research areas include advanced development in AI, engineering materials, and manufacturing technologies, Industry 4.0, design of robotic and thermal systems, materials sustainability, 3D scanning, printing and prototyping, CFD application with FLUENT and IoT etc. In particular, two research seminars and one workshop have been organized in order to facilitate discussions on research ideas among academics for 2022 and 2023 FDS proposal submissions, i.e. seminars entitled "Preparation for the Submission of Research Proposals to FDS in 2022" on 15 November 2021 (page 37) and "Sharing Session for the Submission under FDS" on 14 October 2022 (page 38). In addition, a technical workshop named "Workshop on Preparation for FDS Proposal" was held on 20 August 2021 (page 40) for enhancing staff's FDS proposal quality.

To support staff's research projects in various strategic areas, the Laboratory Sub-committee further developed the Energy Conversion and Utilisation, Acoustics and Robotics, and Electric Vehicles and Electrical Engineering Laboratories in Rooms 1306, UG11, and 801 of the Hung Hom Bay Campus of PolyU SPEED since September 2021. The equipment and instruments required by the experimental investigations of the research projects performing by the RCADMM Members are acquired via purchasing and fabricating (some of them are shown in Pages 33-35, 89-91 & 116-123).

6.3 If the project has not met its original objectives, why?

N/A

6.4 (a) Please provide details e.g., title, authorship, publication dates, etc. and attach an abstract of each publication reported. Please place asterisks on publications involving inter-institutional collaborations.

Conference Presentation (refer to Appendix IV(a), Pages 92-96): the planned target is 8 Conference presentation per year (i.e. 24 presentations in 3 years)

Refer to Appendix IV(a) on Pages 92-96, the RCADMM Members have made 49 Conference Presentations during the project period from 2020 to 2022 with the findings obtained from their research work. Due to the COVID 19, the presentations are made either on site or online for conferences held in Hong Kong as it is impossible to attend overseas conference/seminar in person during that period. It is grateful to find that the Members are keeping active to present papers at conferences/seminars.

Publication of Refereed Journal paper (refer to Appendix IV(b), Pages 97-106): the planned target is to publish 8 Journal Papers (i.e. 24 papers in 3 years)

Refer to Appendix IV(b) on Pages 97-106, the RCADMM Members have published 125 papers in refereed Journals. Majority of these papers are published in high-ranking Journals of very good Impact Factor including:

- Journal of Cleaner Production (Dr W. T. Ho, IF: 9.297)
- Composites Science and Technology (Dr B. Zhu, IF: 8.528)
- International Journal of Production Economics (Dr H. L. Chan, IF: 7.885)
- Journal of Manufacturing Technology Management (Dr Z. Ali, IF: 7.547)
- International Journal of Bioprinting (Dr S. P. Ng, IF: 6.638)
- Fuel (Prof C. W. Leung, IF: 6.609)
- Building and Environment (Dr H. Zhang, IF: 7.093)
- Energy Policy (Dr Y. Wu, IF: 6.142)
- Transportation Research Part D: Transport and Environment (Dr Y. Y. Lau, IF: 5.495)
- Physics Review Applied (Dr S. J. Liang, IF: 4.985)
- Environmental Science and Pollution Research (Dr K. Y. Tong, IF: 4.223)
- Sustainability (Dr Y. Y. Lau, IF: 3.251)
- Computers in Biology and Medicine (Dr S. P. Ng, IF: 7.7)
- Vehicular Communications (Dr Y. Y. Lau, IF: 8.373)
- Corporate Social Responsibility and Environmental Management (Dr T. M. Wut, IF: 9.8)

- Science Bulletin (Dr S. J. Liang, IF: 18.9)
- Mechanical Systems and Signal Processing (Dr S. J. Liang, IF: 8.4)
- International Journal of Mechanical Sciences (Dr S. J. Liang, IF: 7.68)

The RCADMM has successfully achieved this planned milestone by publishing refereed Journal papers in very good quantity and quality, based directly on the findings obtaining from the research projects.

- (b) RGC funding should have been acknowledged in all activity(ies) / publication(s) / conference(s) papers listed in (a) above. If no acknowledgement has been made in any of the event / publication / paper, please indicate and provide explanations.
 - Refer to Appendix IV(a) and IV(b) (Pages 92-96, and Pages 97-106), the RCADMM has always reminded the Members to acknowledge the funding source including RGC, in publishing the Journal paper or presenting the Conference paper.

We always remind the Members that the journal paper /conference presentation will not be included into RCADMM 's record if the funding source of the research project has not been acknowledged.

- Refer to Attachment to Appendix I (Pages 14-35), the RCADMM has acknowledged that the RGC funding is used to purchase the equipment and instruments to support the research projects.
- Refer to Appendix II(a.1), II(a.2), II(b.1), II(b.2) and II(b.3) (Pages 36-83), the RC ADMM has acknowledged that the RGC funding is used to financially support offering the technical seminars, technical workshops and regional/international conferences.

6.5 Research staff trained

(Please provide names and capacities of research staff trained and elaborate on what training has been provided.)

Achievement of Planned Milestones with providing research training to Research Assistants and Final Year Undergraduate Students: planned to supervise 12 research personnel and undergraduate students per year (i.e. 36 research personnel and undergraduate students in 3 years)

The RCADMM has appointed 10 Research Assistants to help conducting the external funded (essentially research projects (refer to Appendix V(c.1)) on Pages 131-132.

•	RA:	UGC/FDS24/E02/19, Supervisor: Prof C. W. Leung	

- RA: UGC/FDS24/E03/20, Supervisor: Prof C. W. Leung
- RA: UGC/FDS24/E07/20, Supervisor: Dr Zerance Ng
- RA: UGC/FDS24/E09/20, Supervisor: Dr Joseph So
- RA: UGC/FDS24/E02/19, Supervisor: Dr Udaya Kahangamage
- RA: UGC/FDS24/E02/21, Supervisor: Dr Edmond Lam
- RA: UGC/FDS24/E05/21, Supervisor: Dr Zerance Ng
- RA: UGC/FDS24/E03/22, Supervisor: Dr Flora Zhang
- RA: UGC/FDS24/E11/22, Supervisor: Dr Udaya Kahangamage
- RA: UGC/FDS24/B07/22, Supervisor: Dr Joseph Lau

The RCADMM has arranged 41 final year undergraduate degree students to participate in our research projects. They are serving the research projects just as research assistants working under supervision of the RCADMM Members. Student's names, supervisor's names, project titles, contents, and durations of the training of these 41 research training programmes are shown in Appendix V(c.2) on Pages 133-140.

6.6 Specific products

(e.g. patents, software or netware, instruments or equipment, infrastructure developed)

During the project period from 2020 to 2022, the RCADMM has developed the following equipment, laboratories and infrastructures in the areas of Advanced Design, Materials and Manufacturing Technologies:

- To match with the experimental requirements for FDS projects, the Electric Vehicles and Electrical Engineering Laboratory in Room HHB 801, and Acoustics and Robotics Laboratory in Room HHB UG11 have been developed. In addition, the Energy Conversion and Utilisation Laboratory (HHB 1306) has been enhanced in facilities. The involved experimental setups, including Long Travel Axial Extensometer, Hydraulic Hot Press Machine, Argon Plasma Jet Machine, Multi-Materials 3D Printer, Anechoic Chamber for Noise Measurement, UAV Control, Refrigerant-free Refrigeration/Cooling System, and Robotic Vision, are given in Appendix I on Pages 32-35.
- RCADMM members have conducted 14 research/ design projects with significant collaborative efforts/contributions from leading scholars/professionals of other universities/industry to develop materials/systems to address industrial or community needs. The involved experimental setups, including Detection of Active Species in LPG/H2 Flame, Test Rig for Investigation of Blended LPG with Hydrogen Fuel, Working Principle of Cooling Tower and Dehumidifier, Plasma Jet Machine for Cleaning, Flame Retardation Test of Materials, and 3D Scanner to Aid Design, are given in Appendix III on Pages 89-91.
- 19 new experiments (with acquisition of equipment / instruments / computational accessories and enhancement of Laboratories) have been developed by RCADMM to support teaching (laboratory work) and research (experimental investigation). The scopes include Mechanics of materials; Advanced materials for design and technology; Computer-aided technology for design; UAV control; Robotic arm control; Smart grid; Electric vehicle charging; Hydrogen fuel; BIM application as given in Appendix V on Pages 116-123.
- 6.7 Other education activities and / or training and development

Apart from the development of experimental setups and laboratories and training of research personnel/students, the knowledge created from research and development works by the RCADMM used to underpin teaching. Efforts have been made regularly to provide final year projects, improve programme curricula and subject syllabuses.

RCADMM members proposed and supervised 81 final year capstone projects for the Building Engineering and Management (BEM), Electrical Engineering (EE) and Mechanical Engineering (ME) degree programmes (details referred to Appendix V(a) on Pages 110-115).

- Development of an engineering design subject, named SEHS3330 Designing Technical Solutions for the Community, for degree students (subject descriptions given in Appendix V(b.2) on Pages 124-130).
- 6.8 Please highlight any deliverables indicated in the project implementation timetable endorsed by RGC, which have not been covered or achieved as per sections 6.1 to 6.7 above, and explain / elaborate.

This target has not been listed as a quantitative planned milestone, but it is the major objectives to develop RCADMM:

- Objective 2: To provide professional consultancy services to the government/industry/ community sectors in solving problems; and
- Objective 3: To work for or with the industry/community in designing and developing devices/systems to deal with the corporation/market needs.

It is one of our approaches to enhance our research network by conducting consultancy projects/services with collaborative effort of the external scholars/engineers (refer to Appendix II(c) on Pages 84-85). The following consultancy projects are conducting by the RCADMM Members:

- Student Project Works relating to Engineering in Secondary Schools Dr Anand Vyas (Collaborator: CDCC Charity Foundation Ltd.)
- Advise on HKIE Accreditation Prof C. W. Leung (Collaborator: PolyU-AAE Department)
- Thermal Analysis of a Server Room Dr Udaya Kahangamage (Collaborator: EMSD HKSAR)
- Geometrical Tolerance and Weight Analyses of the Mark-Six Lottery Balls Dr Anand Vyas (Collaborator: The Full Sky Technology Limited Dr Mask Social Enterprise)
- Techniques in Applying Coating Deposition Dr Anand Vyas (Collaborator: Huizhou Hungtach Industrial Ltd.)
- Green Packaging Materials Dr Zerance S. P. Ng (Collaborator: Belfino Group Global Ltd.)
- Tin-based Perovskite Nanorod Solar Cell Dr Antony K. C. Lam (Collaborator: PolyU Applied Physics Department)
- Indoor Safety Tracker Dr James C. P. Chau (Collaborator: Mapxus)
- Lifting Beam Using in Construction Sites Dr Zerance S. P. Ng (Collaborator: Honor Consultant Company Limited)
- Development and Testing of Organic Polymers Dr Zerance S. P. Ng (Collaborator: Green Technology Consortium Ltd.)
- Anti-bacteria Graphene Consumer Products Dr Zerance S. P. Ng (Collaborator: Graphene Oil based Technology Group Ltd.)
- Mask Production Dr Anand Vyas (Collaborator: The Full Sky Technology Limited Dr Mask Social Enterprise)

Making use of the collaborative effort, we have the opportunity in designing and developing very useful systems for the community (refer to Appendix III on Pages 86-88) including:

- Design and develop the fall detection device for elderly
- Design the better paths to implement the "Autonomous Organic Farming"
- AI-assisted personal training gear for muscle strength training
- Develop the "Soft Manikin System" aided sports bra design
- Develop the safe and reliable low carbon domestic fuel for Hong Kong
- Develop the indoor safety tracker with robotic vision technology
- Develop the tin-based perovskite nanorod solar cell
- Develop the refrigerant free cooling device for air conditioning system
- Development of plant fiber reinforced polymer composites with enhanced mechanical and flame retardant properties
- Conduct the design, analysis, and prototype testing of lifting beam used in construction sites
- Modelling of quantitative dynamic fit of respirators for healthcare workers
- Design of a novel low-cost prosthetic foot design for unilateral transtibial amputees at elevated activity levels
- 6.9 Please elaborate the role of the managing team in coordinating and managing the project.

Management Structure of the RCADMM:

Management and operation of the RCADMM is responsible by the RCADMM Committee, with aid from three sub committees: Laboratory Development, Seminar and Conference Organization, and Research Personnel/Student Sub-committees. Details are referred to "Section 2 - Investigators and Academic Units Involved" (Pages 1-7).

The RCADMM Committee holds regular meetings in the fourth week of every month to ensure smooth and effective operation of the research center. The major tasks related to laboratory development, seminar/conference/workshop organization, and training of research personnel/student are supported by these three Sub-committees.

Copies of the minutes of the RCADMM Committee as well as those of the three Sub-committees: Laboratory Development, Seminar and Conference Organization, and Research Personnel/Student, are available upon request of the RGC Panel.
7. Awards And Recognition

7.1 Have any research grants been awarded that are **<u>directly</u>** attributable to the results obtained on this IDS Research Infrastructure Grant project? (*Please provide details*)

With the support by the RCADMM, members have submitted 22 research proposals to UGC/FDS and 10 projects have been funded. The total funding obtained from FDS is \$7,544,227 and the successful rate is 45.5%. Members have also submitted 21 research proposals to apply for the internal research fund and all have been funded. The total funding obtained from both FDS and internal funding is \$8,211,213. (details referred to Appendix I on Pages 14 - 35). The internal funding is usually used as seeding money to prepare proposals for external funding.

7.2 Other awards and recognitions as a result of this IDS Research Infrastructure Grant project (*Please specify*)

N/A

8. Other Impacts

8.1 What are the current and expected impacts of the project in terms of its contribution to the local and regional economic and societal well-being? (*e.g., technology transfer, collaboration with external organizations, etc.*)

In addition to achieve the items as specified in Section 6, the RCADMM wishes to obtain the following achievements in the areas of Advanced Design, Materials and Manufacturing Technologies:

- To develop new experiments for the BEM, EE, and ME programmes in application of new technology or updated computer software which are popular in workplace.
- To develop and enhance the research collaboration with other universities and the industry in the areas of Advanced Design, Materials and Manufacturing Technologies.
- To become a reliable partner in solving real life problems encountered by the industry and community related to these areas.
- To nurture active researchers in quantity and quality in these areas.
- To develop/enhance the status of SPEED in the research of Advanced, Materials and Manufacturing Technologies.
- 8.2 Others (*Please specify*)

N/A

9. Statistics on Research Outputs

	Peer-reviewed Journal Publications	Conference Papers	Scholarly Books, Monographs and Chapters	Patents Awarded	Other Rese Output (please spe	arch s cify)
No. of outputs arising directly from this project	125	49	_	-	Type N/A	No.

10. Sustainability of The IDS Research Infrastructure Grant

10.1 Whether there are new ideas evolved **<u>directly</u>** from the project?

After the establishment of RCADMM in 2020, a number of research activities such as research seminars, technical workshops and conferences were conducted and our staff could have much more discussions on new research topics with internal and external researchers. Having considered our college's existing resources and research platforms, we planned to develop several strategic research areas related to "Green Technology and Business" and become a successful Green Research Hub for Hong Kong. The strategic research areas include:

- Desiccant-Enhanced Evaporative Cooling Systems
- Development of Green Fuels
- Green Tourism and Its Implementation
- Development of Sustainable Materials
- Learning-Based Aerial Swarm Fight Hill Fires
- Noise Control with Metamaterial Technologies
- Roadmap of Popularization of Electric Vehicles, and
- Sustainable Business Research
- 10.2 Whether there are new projects evolved **<u>directly</u>** from the project?

With the supports from the RCADMM, the following new FDS research projects are funded and will be started in January 2024:

- Investigation of Hydrogen-enriched Low Calorific Value Landfill Gas Combustion in a Porous Medium Based Burner [UGC/FDS24/E07/23] – Dr Udaya KAHANGAMAGE
- CFD-based Autonomous System of Health Estimation and Maintenance Scheme for Electrical Apparatus of Power Substations in Hong Kong [UGC/FDS24/E08/23] – Dr Hao ZHANG
- An Innovative Hybrid Nanofluid Spray Cooling Based Thermal Management System for Efficient Cooling of Electric Vehicle High Power Electronics [UGC/FDS24/E09/23] – Dr Muhammad ASIM
- Exploring the Use of Sonic Crystal in Noise Barriers [UGC/FDS24/E12/23] Dr Anthony LOH
- Development of Mycelium-Based Composites with Enhanced Mechanical and Thermal Properties for Diabetic Foot Insoles [UGC/FDS24/E15/23] – Dr Zerance NG

10.3 Whether there are new collaborations developed <u>directly</u> from the project?

In March 2023, the UCP Group, a manufacturer of artificial floral and seasonal home products in Hong Kong, had a collaboration project with the RCADMM for the development of durable and sustainable solutions for recycled plastic products. After the company has received the promising experimental results from the RCADMM, the UCP Group donated the amount of HK\$5 million dollars (5 installments in 5 years) to PolyU SPEED for further development of new sustainable materials through the Koo Meng Li and Koo Mi Wen Na Charitable Foundation (KML Foundation).

10.4 Please give details on how much money and from which sources has been obtained for the specific purpose of continuing the work started under this IDS Research Infrastructure Grant project.

After the project period, the operations of the RCADMM and the three sub-committees will continue and the research activities (i.e. seminars, workshops, conferences and training of research personnel/students) will be organized regularly. The breakdown of annual budget is given below.

(1)	Supporting Staff Costs:		
	PT Project Assistant		
(2)	Conference Expenses:		
	Photo and video taking		
	Refreshment & Lunch		
	Printing of posters and leaflets		
	Name badges & souvenirs		
	Student helpers		
(3)	Training of Research Personnel/Students		
(4)	General Expenses	Total:	

This proposed budget is supported by PolyU SPEED.

11. Public Access Of Completion Report

(Please specify the information, if any, that cannot be provided for public access and give the reasons.)

Information that Cannot Be Provided for Public Access	Reasons	
N/A	N/A	

IDS(R)8 (Oct 2019)

RGC Ref. No.: UGC/FDS(R)24/19 (please insert ref. above)

INSTITUTIONAL DEVELOPMENT SCHEME (IDS) RESEARCH INFRASTRUCTURE GRANT

Summary of Completion Report

(Please list all the stages since project inception)

Project Title:

Establish the Research Centre for Advanced Design, Materials and Manufacturing Technologies (RCADMM) in PolyU SPEED

Stage Completed	Period	Milestones		
	(Month / Year) to (Month / Year)	Deliverables to be Achieved ² (Please summarize in <u>three</u> bullet points where details should be left to the report proper)	% of Each Deliverable Achieved ³	
First Year	01/2020 to 12/2020	 Submit 4 Research Proposals to obtain UGC FDS (actual 6 Submissions and 3 of them are funded) Publish 8 Journal Papers and make 8 Conference Presentations (actual: 24 Journal & 10 Conf. Papers) Hold 1 Conference, 3 Seminars & Workshops (actual: 1 Conference in April 2021, 3 Seminars & 5 Workshops) 	1. 100% 2. 100% 3. 100%	
Second Year	01/2021 to 12/2021	 Submit 4 Research Proposals to obtain UGC FDS (actual 8 Submissions and 4 of them are funded) Publish 8 Journal Papers and make 8 Conference Presentations (actual: 45 Journal & 15 Conf. Papers) Hold 1 Conferences, 3 Seminars & Workshops (actual: 1 Conferences, 4 Seminars & 7 Workshops) 	1. 100% 2. 100% 3. 100%	

Stage Completed	Period		Milestones	
	(Month / Year) to (Month / Year)		Deliverables to be Achieved ² (Please summarize in <u>three</u> bullet points where details should be left to the report proper)	% of Each Deliverable Achieved ³
Third Year	01/2022 to 12/2022		 Submit 4 Research Proposals to obtain UGC FDS (actual 8 Submissions and 3 of them are funded) Publish 8 Journal Papers and make 8 Conference Presentations (actual: 56 Journal & 24 Conf. Papers) Hold 1 Conference, 3 Seminars & Workshops (actual: 1 Conference, 4 Seminars & 7 Workshops) 	1. 100% 2. 100% 3. 100%
	Total to-date:			

 Note: ¹ Justifications for significant under-spending or over-spending (≥±10%) should be given in section 5.1 of the completion report.
 ² The key milestones to be achieved by the project within the respective stage as indicated in the approved implementation timetable.
 ³ Justifications for significant slower rate of progress compared with the approved implementation timetable should be provided in detail in section 4 of the completion report.

<u>Appendix VII – Implementation Time-table of RCADMM (1/2020 – 12/2020)</u>

Project Reference: UGC/IDS(R)24/19 Institution: PolyU SPEED

Project Title: Establish the Research Centre for Advanced Design, Materials and Manufacturing Technologies (RCADMM) in PolyU SPEED

Year	Date	Milestones	% of Project Expected	Fulfilled
			to be Completed	(Yes/No)
1 st	Jan 2020	1. Submit 4 internal funded (CPCE Research Fund) research projects by Members	4%	Yes
(2020)	March 2020	2. Submit 4 external funded (FDS funded) research projects by Members	8%	Yes
	March 2020	3. Hold the 1st Seminar/Workshop with 3 presentations by RCADMM	1%	Yes
	June 2020	4. Hold the 2 nd Seminar/Workshop with 3 presentations by RCADMM	1%	Yes
	Sept 2020	5. Hold the 3 rd Seminar/Workshop with 3 presentations by RCADMM	1%	Yes
	Oct 2020	6. Submit progress reports on on-going research projects by Members	2%	Yes
	Dec 2020	7. Hold the 1-day Regional Conference with 10 presentations by RCADMM*	3%	N/A
	Jan 2021	7. Hold the 4 th (additional) Seminar/Workshop with 3 presentations by RCADMM*	1%	Yes
	Jan 2020 – Dec 2020	8. Publish 8 journal papers and 8 conference papers by Members	8%	Yes
	Jan 2020 – Dec 2020	9. Supervise 12 Research Personnel/Students by Members	3%	Yes
	Dec 2020	10. Submit the 1st Year Progress Report of the RCADMM by the Team Leader	2%	Yes
	Jan 2020 – Dec 2020	11. Continue with on-going external-funded and internal-funded research projects	N/A	Yes
		by Members		

<u>1st Year Operation (1/2020 – 12/2020)</u>

* In the original plan, a 1-day Regional Conference on "Advanced Materials and Industry 4.0" was planned to offer on 9/12/2020. Due to the COVID-19, date of the Conference was changed to 9/4/2021. We applied to the RGC about the change and approval had been granted in August 2020.

Instead, we had offered an additional Seminar in January 2021 to fill the gap.

Appendix VII – Implementation Time-table of RCADMM (1/2021 – 12/2021)

Project Reference:

UGC/IDS(R)24/19

Institution: PolyU SPEED

Project Title: Establish the Research Centre for Advanced Design, Materials and Manufacturing Technologies (RCADMM) in PolyU SPEED

<u>2nd Year Operation (1/2021 - 12/2021)</u>

Year	Date	Milestones	% of Project Expected	Fulfilled
			to be Completed	(Yes/No)
2 nd	Jan 2021	12. Submit 4 internal funded (CPCE Research Fund) research projects by Members	4%	Yes
(2021)	March 2021	13. Submit 4 external funded (FDS funded) research projects by Members	8%	Yes
	March 2021	14. Hold the 1st Seminar/Workshop with 3 presentations by RCADMM	1%	Yes
	April 2021	15. Hold the 1-Day Regional Conference with 10 presentations by RCADMM **	3%	Yes
	June 2021	16. Hold the 2 nd Seminar/Workshop with 3 presentations by RCADMM	1%	Yes
	Sept 2021	17. Hold the 3 rd Seminar/Workshop with 3 presentations by RCADMM	1%	Yes
	Oct 2021	18. Submit progress/ completion reports on on-going/completed research projects by	2%	Yes
		Members		
	Dec 2021	19. Hold the 1-Day Regional Conference with 10 presentations by RCADMM	3%	Yes
	Jan 2021 – Dec 2021	20. Publish 8 journal papers and 8 conference papers by Members	8%	Yes
	Jan 2021 – Dec 2021	21. Supervise 12 Research Personnel/Students by Members	3%	Yes
	Jan 2021 – Dec 2021	22. Continue with on-going external-funded and internal-funded research projects by	N/A	Yes
		Members		
	Dec 2021	23. Submit the 2nd Year Progress Report of the RCADMM by Team Leader	2%	Yes

** The 1-day Regional Conference on "Advanced Materials and Industry 4.0" scheduled to offer on 9/4/2021 has been successfully held on 17/8/2021.

Appendix VII – Implementation Time-table of RCADMM (1/2022 – 12/2022)

Project Reference:	UGC/IDS(R)24/19	Institution:	PolyU SPEED
5			

Project Title: Establish the Research Centre for Advanced Design, Materials and Manufacturing Technologies (RCADMM) in PolyU SPEED

<u>3rd Year Operation (1/2022 - 12/2022)</u>

Year	Date	Milestones	% of Project Expected	Fulfilled
			to be Completed	(Yes/No)
3 rd	Jan 2022	24. Submit 4 internal funded (CPCE Research Fund) research projects by	4%	Yes
(2022)		Members		
	March 2022	25. Submit 4 external funded (FDS funded) research projects by Members	8%	Yes
	March 2022	26. Hold the 1st Seminar/Workshop with 3 presentations by RCADMM	1%	Yes
	June 2022	27. Hold the 2 nd Seminar/Workshop with 3 presentations by RCADMM	1%	Yes
	Sept 2022	28. Hold the 3 rd Seminar/Workshop with 3 presentations by RCADMM	1%	Yes
	Dec 2022	29. Hold the 3-day International Conference with 48 presentations by RCADMM	4%	Yes
	Jan 2022 – Dec	30. Publish 8 journal papers and 8 conference papers by Members (throughout	8%	Yes
	2022	2022)		
	Jan 2022 – Dec 31. Supervise 12 Research Personnel/Students by Members (throughout 2022)		3%	Yes
	2022			
	Jan 2022 – Dec	32. Continue with on-going external-funded and internal-funded research projects	N/A	Yes
	2022	by Members (throughout 2022)		
	Jan 2022 – Dec	33. Submit progress reports on on-going/completed research projects by Members	2%	Yes
	2022	(throughout 2022)		
	Dec 2022	34. Submit the Completion Report of the RCADMM by Team Leader	2%	Yes

Summary on Achievements vs Planned Milestones of RCADMM in 2022:

Item	Planned Milestones of RCADMM in 2022 (see Page 187)	Achievements of RCADMM in 2022	Remarks
24	To submit 4 research project proposals for internal CPCE Research Fund by RCADMM Members	 To submit 7 research project proposals for internal CPCE Research Fund and all 7 projects are funded 	Successfully Achieved
25	To submit 4 research project proposals for external Grant (especially UGC/FDS) by RCADMM Members	• To submit 8 research proposals to FDS – 3 proposals are funded	Successfully Achieved
26, 27, 28	To hold the 1^{st} , 2^{nd} , and 3^{rd} Seminar/Workshop with $(3 - 4)$ presentations each time by RCADMM	 To hold 4 research seminars on 3/4, 8/8, 14/10 and 18/11 To hold 7 technical workshops on 21/1, 19/4, 28/6, 19/7, 29/7, 29/8 and 18/11 	Successfully Achieved
29	To hold ONE 3-day Conferences with 48 presentations by RCADMM	 To hold ONE 2-day conference (6 – 7 /10/2022 with 35 presentations) on International Conference on Advances in Design, Materials and Manufacturing Technologies 2022 	Successfully Achieved
30	To publish 8 journal papers and make 8 conference presentations by RCADMM Members (throughout 2021)	To make 24 conference presentationsTo publish 56 papers in refereed journals	Successfully Achieved
31	Supervise 12 Research Personnel/Students by RCADMM Members (throughout 2022)	 To supervise 3 Research Assistants working in our external funded research projects To supervise 14 Undergraduate Students working in our research projects 	Successfully Achieved
32	To continue with on-going external-funded and internal-funded research projects by RCADMM Members	 RCADMM Committee has regularly discussed with the Members to ensure smooth progress of their research projects There is no problem case reported 	Successfully Achieved
33	To submit progress reports on on-going/completed research projects by RCADMM Members	 RCADMM Committee has regularly reminded the Members to ensure submission of the progress/completion reports There is no problem case reported 	Successfully Achieved
34	To submit the 1 st Year Progress Report of the RCADMM by Team Leader to RGC	 The 2nd Year Progress Report of the RCADMM will be submitted to RGC before the deadline 	Successfully Achieved

Summary on Achievements vs Project Objectives of RCADMM in 2022:

Objective	RCADMM Objectives (Section 4 on Pages 8 – 13)	Achievements of RCADMM in 2022	Remarks
1	To acquire funding from various possible sources to support and sustain research activities in dealing with the community and environmental problems.	 Submit 8 research proposals to FDS – 3 proposals are funded Submit 7 research proposal to Internal Fund – 7 proposals are funded 	Successfully Achieved
2	To provide professional consultancy services to the government/ industry/ community sectors in solving problems and providing technical seminars/ workshops/ conferences.	 To hold 4 research seminars To hold 7 technical workshops To hold ONE 2-day conference (International Conference on Advances in Design, Materials and Manufacturing Technologies 2022) To conduct 7 consultancy projects/services # 	Successfully Achieved
3	To work for or with the industry/ community in designing and developing devices/ systems to deal with the corporation/ market needs.	• To carry out 9 research/design projects to develop materials/systems addressing the industry/community needs #	Successfully Achieved
4	To contribute updated knowledge to academic sectors and to enhance our research status by presenting research findings via international conferences/ refereed journals.	 To make 24 conference presentations To publish 56 papers in refereed journals 	Successfully Achieved
5	To underpin teaching with knowledge created from research and development works. Efforts will be made regularly to provide final year projects, improve programme curricula, and subject syllabuses, and nurture the research personnel/ students.	 Provide 40 final year projects to BEM, EE, and ME programmes # Develop an engineering design subject, named SEHS3330 Designing Technical Solutions for the Community, for degree students # To help developing/enhancing the Engineering/Sciences Laboratories for teaching and research # Provide research training to 3 RAs and 14 Undergraduate Students 	Successfully Achieved
6	To develop active and competent researchers, in both quantity and quality, such that the critical mass and culture in research can be formed in PolyU SPEED eventually.	 The RCADMM Members are competent to: Fulfill the above 5 Objectives (1 – 5) Actively conducting collaborative research projects with peers from other universities to enhance our research network # 	Successfully Achieved

Exact number of the specified activity has not been determined in the original implementation plan therefore it has not been identified as a quantitative milestone.