



Mechanical and Automation Engineering



Department of Mechanical and Automation Engineering
The Chinese University of Hong Kong



Foreword

Engineering creates Real Value for the society

Engineering is not about passing goods or dollars from one hand to another and making profit out of the process. Engineering is about creating real value for the society. It is the pursuit of science for direct benefit of mankind, creating a better and safer world for humans. It encompasses turning natural materials to bridges and optical fiber and robots, and transforming sunlight and wind and waterfalls to power sources. The world would be an entirely different one without engineering innovations. It must be noted that engineering is beyond mere application of science. Almost every task in engineering, be it building a robot that can walk on two legs, or turning waterfall into energy source, is about a problem that does not come from nature but exists only after the task is spelled out, whose solution demands both innovation and deep analysis. Engineering is both application and furtherment of science.

Engineering Education is for Engineering career, and beyond

Engineering training is not just about preparing engineers for the society. The training has a great deal to do with abstracting real-life problems to bare bone form, relating the problems to scientific and mathematical tools by so doing, arriving at solutions that can withstand uncertainties and disturbances in the real world, and designing proper human interface to ensure ease of use. A problem-solving approach like this has tremendous value in many sectors of the society. Numerous prominent corporate executives, technical consultants, entrepreneurs came from engineering background. A solid engineering education opens the door to many career options beyond engineering.

The MAE Discipline focuses on Modern Engineering

The **Mechanical and Automation Engineering (MAE)** Department of CUHK aims at offering solid education and cutting-edge research opportunities around two aspects of engineering: (1) the proper physical interaction of engineering systems with the physical world through force, heat, and energy (and hence the word "*Mechanical*" in the department name); and (2) the self-operability of the systems demanding minimum intervention from humans (and hence the word "*Automation*").

The physical interaction of engineering innovations with the world is important because Engineering is, after all, about restructuring the environment for human convenience and safety. MAE seeks to design and control such interaction based upon fundamental knowledge on rigid body mechanics, fluid mechanics, thermodynamics, and conservation of mass and energy.

It is also desired that engineering systems do not just do what is instructed but exhibit certain degree of autonomy in their operations. To achieve that, MAE seeks to use tactile, force, range, temperature, and other sensors to measure system performance, link system performance to system input, and design intelligent algorithms for making fast and right decisions.

The aspects form the core of modern engineering. Knowhow on such aspects allows engineers to reach far in their innovations.

Accredited by the Hong Kong Institution of Engineers (HKIE), the programme is known for its good design and quality teaching.

MAE welcomes You

We invite you to browse through our website <<http://www.mae.cuhk.edu.hk>> to learn more about the Department, the professors, the academic programmes, and the researches.

We welcome anyone with a "heart" on engineering to join us pursue the exciting opportunities in MAE.



Programme Curriculum

Year 1

Faculty Package

ENGG1110 Problem Solving By Programming
ENGG1120 Linear Algebra for Engineers
ENGG1130 Multivariable Calculus for Engineers

Foundation Courses

MAEG1020 Computational Design and Fabrication
MATH1510 Calculus for Engineers
PHYS1110 Engineering Physics: Mechanics and Thermodynamics

University Core Requirements

English (4 units), Chinese (3 units), College GE (3 units),
Foundation GE (3 units) & PE (2 units)

Year 2

Foundation Courses

ENGG2720 Complex Variables for Engineers (2 units)
ENGG2740 Differential Equations for Engineers (2 units)

Major Required Courses

EEEN3030 Engineering Materials
ELEG2202 Fundamentals of Electric Circuits
MAEG2020 Engineering Mechanics
MAEG2030 Thermodynamics
MAEG2601 Technology, Society and Engineering Practice (2 units)

Major Elective

**Breadth Elective (0-3 units)

University Core Requirements

English (3 units), Chinese (3 units), Foundation GE (3 units) &
Other GE (3 units)

MAEG2602 Engineering Practicum (1 unit)
(5 weeks)

Year 3

Major Required Courses

MAEG3010 Mechanics of Materials
MAEG3020 Manufacturing Technology
MAEG3030 Fluid Mechanics
MAEG3040 Mechanical Design
MAEG3050 Introduction to Control Systems
MAEG4030 Heat Transfer

Major Electives

**Breadth or Depth Electives (0-6 units)

University Core Requirements

English (2 units), College GE (3 units), Other GE (3 units) & IT (1 unit)

Year 4

Major Required Courses

MAEG4998 Final Year Project I
MAEG4999 Final Year Project II

Major Electives

**Breadth or Depth Electives (6-12 units)

University Core Requirements

Other GE (3 units)

Major Electives

Design and Manufacturing Stream

(B) / (C) CSC11020 Hands-on Introduction to C++ (1 unit)
(B) / (E) MAEG3060 Introduction to Robotics
(B) / (E) MAEG3070 Fundamentals of Computer-Aided Design
(B) / (E) MAEG3080 Fundamentals of Machine Intelligence
(B) / (E) MAEG3920 Engineering Design and Applications
(D) / (E) MAEG4010 Computer-Integrated Manufacturing
(D) / (E) MAEG4020 Finite Element Modelling and Analysis
(D) / (E) MAEG4060 Virtual Reality Systems and Applications
(D) / (E) MAEG4070 Engineering Optimization
(D) / (E) MAEG5030 Geometric Computing for Design and Manufacturing
(B) / (E) MAEG5050 MEMS and Nano-Robotics
(or ENGG5404 Micromachining and Microelectromechanical Systems)
(D) / (E) MAEG5100 Advanced Engineering Design and Optimization
(or ENGG5405 Theory of Engineering Design)
(B) / (E) MAEG5120 Nanomaterials and Nanotechnology: Fundamentals and Applications
(B) / (E) MAEG5130 Computational Mechanics
(B) / (E) SEEM3500 Quality Control and Management

Mechatronics Stream

(B) / (C) CSC11020 Hands-on Introduction to C++ (1 unit)
(C) / (D) MAEG4040 Mechatronic Systems
(C) / (D) MAEG4050 Modern Control Systems Analysis and Design
(B) / (E) ELEG2401 Introduction to Embedded Systems
(B) / (E) ENGG2020 Digital Logic and Systems
(B) / (E) MAEG3080 Fundamentals of Machine Intelligence
(B) / (E) MAEG5050 MEMS and Nano-Robotics
(or ENGG5404 Micromachining and Microelectromechanical Systems)
(B) / (E) MAEG5080 Smart Materials and Structures

Robotics and Automation Stream

(B) / (C) CSC11020 Hands-on Introduction to C++ (1 unit)
(B) / (C) MAEG3060 Introduction to Robotics
(C) / (D) MAEG4050 Modern Control Systems Analysis and Design
(B) / (E) MAEG1010 Introduction to Robot Design
(D) / (E) MAEG4010 Computer-Integrated Manufacturing
(D) / (E) MAEG5010 Advanced Robotics
(or ENGG5402 Advanced Robotics)
(D) / (E) MAEG5020 Topics in Linear Control Systems
(or ENGG5403 Linear System Theory and Design)
(B) / (E) MAEG5050 MEMS and Nano-Robotics
(or ENGG5404 Micromachining and Microelectromechanical Systems)
(D) / (E) MAEG5090 Topics in Robotics
(B) / (E) MAEG5120 Nanomaterials and Nanotechnology: Fundamentals and Applications

Others

(B) CSC12040 Introduction to Python (2 units)
(B) CSC12100 Data Structures
(B) CSC12120 Introduction to Software Engineering (2 units)
(B) CSC13170 Introduction to Database Systems
(B) ~DSME1030 Economics for Business Studies I
(B) EEEN2020 Renewable Energy Technologies
(D) EEEN4010 Kinetic Energy Harvesting Devices and Systems
(D) EEEN4020 Solar Energy and Photovoltaic Technology
(D) EEEN4030 Nuclear Energy and Risk Assessment
(D) EEEN4050 Energy Storage Devices and Systems
(D) EEEN4060 Energy Distribution
(B) ELEG3101 Medical Instrumentation and Sensors
(B) ENGG1820 Engineering Internship (1 unit)
(B) ENGG2760 Probability for Engineers (2 units)
(B) ENGG2780 Statistics for Engineers (2 units)
(D) MAEG4080 Introduction to Combustion
(D) MAEG5060 Computational Intelligence
(D) MAEG5070 Nonlinear Control Systems
(D) MAEG5110 Quantum Control and Quantum Information
(B) MAEG5140 Materials Characterization Techniques
(D) MAEG5150 Advanced Heat Transfer and Fluid Mechanics
(B) MGNT1010 Introduction to Business
(B) MGNT4090 Technology and Innovation Management
(B) ~SEEM2440 Engineering Economics
(B) SEEM3450 Engineering Innovation and Entrepreneurship
(B) SEEM3490 Information Systems Management

** At least 6 units of Major Electives at MAEG4000 and above level or their reciprocal ESTR courses or courses at ENGG5000 level are required.

- (B) - Breadth Electives (6 units are required)
(C) - Compulsory Courses in specific streams
(D) - Depth Electives (6 units are required)
(E) - Electives in specific streams

~ Students can take either DSME1030 or SEEM2440 but not both.

To qualify for a stream, students must complete a minimum of 12 units taken under the stream.

For updated information, please refer to <http://www.mae.cuhk.edu.hk>.

Summary

University Core Requirements (39 units):

- General Education (College/Foundation/Others)	21
- Languages (English & Chinese)	15
- Physical Education	2
- IT	1

Major Requirements (75 units):

- Faculty Package	9
- Foundation Courses	13
- Required Courses	33
- Elective Courses ** (Breadth & Depth)	14
- Final Year Projects	6
Free Electives (9 units)	9

Total	<u>123</u>
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MAE Scholarship

Industrial Scholarship

With the generous donations from a number of industrial companies, many industrial scholarships are set up specifically for MAE students.

Internship and Student Exchange Programme

MAE students could opt for summer internship, work-study, or international student exchange programme. The in-field training helps prepare students to be the next generation professional engineers.

Career Prospects

Upon graduation, MAE students will find career opportunities as mechanical engineers, production engineers, control engineers, design engineers, process engineers, maintenance engineers, systems managers, and other professions. They can also pursue postgraduate studies at local or overseas universities.

MAE Alumni

Lam Miu Ling Cherry (BEng 2000, MPhil 2002 & PhD 2008) Associate Professor, City University of Hong Kong

I am a media artist and associate professor in School of Creative Media at City University of Hong Kong. I received my BEng, MPhil and PhD degrees all from the Department of Mechanical and Automation Engineering of The Chinese University of Hong Kong with a focus on robotics and wireless sensor network research. I was an engineer in Hong Kong Aero Engine Services Limited before the PhD Programme. Upon PhD graduation, I was awarded a prestigious fellowship by the Croucher Foundation to support my postdoctoral research at the California Nanosystems Institute at UCLA. My current research projects focus on bioinformatics and physical intelligence.

As a media artist, I create artworks on the cutting-edge technologies and at the intersection of art, technology and science. The trainings on computer science, engineering design, and electronics obtained from MAE Department equipped me to explore new art dimensions by introducing novel ingredients to media arts. The MAEG Programme is not only practical for the development of engineering perspectives and researches, but also offering the possibilities to bridge across multiple disciplines. *By Cherry Lam*



Lam Hiu Fung (BEng 1999, MPhil 2001 & PhD 2004) Chairman and Chief Executive Officer (CEO), Sengital Limited

Dr. Alan Lam received his BEng and MPhil degrees from the Department of Mechanical and Automation Engineering. He obtained his PhD degree specializing in systems integration with focus of MEMS sensing systems. He is the inventor of VRMS, and the leader of the VRMS technology team.

Dr. Lam is active in academic in Hong Kong. He supervised over 300 students over past 10 years and currently is the external program board member of Shatin IVE Electronic Engineering Department, an adjunct professor and an advisory board member of Department of Electronic Engineering of City University of Hong Kong. He is also an adjunct professor and an advisory committee member of the Department of Mechanical and Automation Engineering of The Chinese University of Hong Kong. On industrial side, he is a committee member of HKPKI forum, a member of IEEE, a member of HKIE, a professional member of HKIA and a member of HKETA.

Dr. Lam is one of the founders of Sengital Ltd. and is now working as the Chief Executive Officer. Currently, Sengital is a corporate member of Hong Kong Medical and Healthcare Device Industries Association; a corporate member of HKEIA, a corporate member of HKCA and an associate member of ZigBee Alliance.

Dr. Lam was selected as one of the Ten Outstanding Young Persons by the Junior Chamber International Hong Kong (JCIHK) in 2015.
By Lam Hiu Fung

Leung Yun Yee (BEng 2014 & MPhil 2016) PhD Candidacy in Mechanical and Automation Engineering, CUHK

I have been studying in The Chinese University of Hong Kong for the past seven years already, and am currently a PhD candidate in the Department of Mechanical and Automation Engineering (MAE). I also received my BEng and MPhil in the same discipline. I chose to study engineering because I wanted to make use of the knowledge from different subjects to invent something to help others. When I was still a secondary school student, I studied a subject called Design and Technology, where I learnt some topics that are practically related to engineering and how to apply different disciplines to design something new. My effort on developing different devices and systems was recognized by the target users in different sharing events. These experiences encouraged me to aim at being an engineer.

MAE has an innovative and inspiring research environment. When I was still a secondary form five student, I was given a chance to join an internship to work with Professor YAM Yeung on improving my invention. This was the first time I got to know more about the department and I was impressed by the research environment.

For the last seven years, my studies allowed me to learn a wide range of subjects related to engineering, for example, fluid mechanics, structure and programming, and more. Through projects related to medical robotics and artificial intelligence, I had the opportunity to gain research experience and skills. Besides, the university provided me many chances in applying all the knowledge through various invention competitions, for example, with my invention i-Device, I was awarded Bronze Award in the 2013 Hong Kong Information and Communication Technology Awards and came 1st runner-up in "Present Around the World Hong Kong 2012". In addition to invention competitions, I also received Google Anita Borg Memorial Scholarship 2015, Talent Development Scholarship 2015/16 and Li Po Chun Charitable Trust Fund Postgraduate Scholarship 2017/18. These scholarships encourage me to pursue on my journey in developing products to benefit others. I aspire to continue my studies and research works on AI robotics, to bridge the gap between human and robotics. *By Leung Yun Yee*



Admissions

For details of the admission information, please refer to the Faculty brochure or the Faculty website <http://www.erg.cuhk.edu.hk>.

Enquiry

Department of Mechanical and Automation Engineering
Room 213, William M. W. Mong Engineering Building
The Chinese University of Hong Kong, Shatin, N.T., Hong Kong

Tel. No.: 3943 8044 Fax No.: 2603 6002
Email: dept@mae.cuhk.edu.hk
Homepage: <http://www.mae.cuhk.edu.hk>