

工程導論各主題課程授課教師表

課程主題	授課教授
能源	呂世源 老師
機械、機電整合與智慧機械	洪健中 老師
虛擬材料設計選用	葉安洲 老師
最佳化與工業工程	洪一峯 老師
Introduction to Sensors and Actuators	王威智 老師

一、課程說明(Course Description)

※能源

The course aims to give a general understanding of contemporary energy issues from engineering/technical as well as economical/social points of view. It provides freshmen of the College of Engineering with global vision of energy-related topics before more detailed studies of materials, devices, processes, etc. in their subsequent years of professional development.

※機械、機電整合與智慧機械 Machine, Mechatronics, and Smart Machinery

The course aims to give a general understanding of contemporary electromechanical system integration issues from engineering/technical as well as economical/social points of view. It provides freshmen of the College of Engineering with global vision of system-related topics before more detailed studies of materials, devices, interface, processes, etc. in their subsequent years of professional development.

The course includes project-based learning (PBL) to learn how to establish effective collaboration among students and how to facilitate student-driven activities.

※虛擬材料設計選用 – Cyber Materials Design and Selection

Case studies such as materials for jet engine and automobile will be used to demonstrate cyber materials selection and design by ANSYS Granta Edupack. This course utilizes a design-lead approach to introduce materials science, then the choice of materials and processes needed to achieve the microstructure and properties are described, finally the scientific aspects of the subject can be introduced in more details in order to build up the understanding of Structure-Process-Property correlation.

※最佳化與工業工程

介紹工業工程部分的重要技術，包含生產管理概念、作業研究、線性規劃及整數規劃之建模技術、最佳化演算法與實例，並利用套裝軟體實做數學規劃之建模與求解。

※Introduction to Sensors and Actuators

This exciting 7-week series will introduce you to some basic principles and techniques of sensors and actuators through a project-based approach which stresses teamwork, design process, specialties and tools of engineering, creative and analytical thinking, and opened problems solving. After successful completion of this part of the course, students will have some basic understanding of sensors and actuators and their applications. There

will be four sensors and actuators related hands-on design projects. The projects will vary from year to year.

二、指定用書(Text Books)

※機械、機電整合與智慧機械

Lecture notes (課程講義)

※Introduction to Sensors and Actuators

Reading packets and assignments are available on the course web site: (TBA)

Supplemental reading materials will be handed out in class.

三、參考書籍(References)

※機械、機電整合與智慧機械

1. J. P. Davim, Introduction to Mechanical Engineering, Springer, Cham, Switzerland, 2018.

2. 林柏超, 機械常識, 千華數位文化股份有限公司, 9th ed., 2019.

※虛擬材料設計選用

Materials, 3rd Edition, Engineering, Science, Processing and Design, eBook ISBN:
9780080982816

四、教學方式(Teaching Method)

※能源

Lectures with PPT/video presentations

※機械、機電整合與智慧機械

1. Lectures (10:10 – 12:00 on Wednesday at Room 107, ENG_I)

2. PBL discussion at office hours / scheduled meetings

3. Team work

Instructor (授課教師)

Dr. Chien-Chong Hong (洪健中教授)

Room 512 in Engineering Building I

03-5715131 (ext. 33736)

cchong@mx.nthu.edu.tw

Office hour: Friday 14:20 – 15:10 or reserved via e-mail

※虛擬材料設計選用

Power-point slides lectures

Introduction of ANSYS Granta Edupack

五、教學進度(Syllabus)

※能源

1. Introduction to Engineering
2. Depletion of fossil fuels and extreme climates
3. Fossil, nuclear, and renewable energies
4. Energy generation – solar cells
5. Energy storage – lithium ion battery, hydrogen economy, fuel cells
6. Energy saving – smart grid

※機械、機電整合與智慧機械

- 第一週 機械工程簡介、發展史與課程地圖
第二週 機械設計與製造
第三週 熱傳與流體系統
第四週 控制、感測與機電系統整合
第五週 智慧機械與創新科技
第六週 複習
第七週 PBL Project 競賽
第八週 PBL Project 報告

※虛擬材料設計選用

1. Introduction of the course
2. Introduction of various materials
3. Materials card game
4. Cyber materials selection and design / case studies
5. Group exercise with Materials selection with Ansys Edupack
6. Summary and conclusion

※最佳化與工業工程

1. 作業研究
2. 線性規劃
3. 整數規劃
4. 生產管理

※Introduction to Sensors and Actuators

Week 1 Engineering Design and Process, Scientific and Technical Documentation (e.g. memo, journal

keeping, technical report and other formal report writing) Toy Design and icebreaker project.

Week 2 Introduction to MEMS (What is MEMS, components of MEMS, fabrication, operation and application) and Introduction to basic electricity

Week 3 Fundamental of Sensors & Actuators (Introduction to light sources and detectors)

Light transceiver project, Nametag project presentation

Week 4 Optical transducer project (Application of light sensor in engineering design, oral and final report in the end of the project)

Week 5 Fundamental of Sensors & Actuators (Introduction to smart structures and materials)
SMA Design project assigned

Week 6 SMA Design project (Application of shape memory alloy actuator in engineering design, oral and final report in the end of the project)

Week 7 Introduction to Final project: paper MEMS project

Week 8 Final Project Presentation

六、成績考核(Evaluation)

※能源

In-class notes (40%) and final exam (60%).

※機械、機電整合與智慧機械

final exam 65%

PBL project 25% (performance and presentation)

Bonus 10% (attendance, answering to in-class questions, etc.)

Examination: There will be **one** exam in the semester. See the tentative schedule for examination dates. Please see the instructor immediately if a conflict arises.

Academic Honesty: Academic integrity and honesty is essential to achieve high-quality education and to keep the prestige of the institution. We will **not tolerate any academic misconduct, such as cheating**. Cheating includes, but is not limited to: copying directly from unauthorized source, such as friends, classmates or a solutions manual; allowing another person to copy your work; signing another person's name or having another person sign your name on an attendance sheet; taking a test or quiz in someone else's name, or having someone else take a test or quiz in your name; or asking for regrade of a paper that has been altered.

※虛擬材料設計選用

Group report (50 %)

Final exam (50 %)

※最佳化與工業工程

Detail to be announced in the first class

※Introduction to Sensors and Actuators

Participation – 10%

Attendance, water tower project

Nametag project- 10%

Basic Electricity- 5 %

Optical Transducer project- 20%

SMA project- 20%

Final Project – 35%

Weekly Design project- Extra Credit (max ~ 10% of your final grade)

七、可連結之網頁位址 (Course website)

※機械、機電整合與智慧機械

國立清華大學數位學習平台 <http://moodle.nthu.edu.tw/>

※Introduction to Sensors and Actuators

<http://courses.washington.edu/me557/nthu/>