工程導論各主題課程授課教師表

課程主題	授課教授	備註
能源	蘇安仲 老師	
機械、機電整合與智慧機械	林士傑 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	英語授課

一、課程說明(Course Description)

※能源

This series of 7 lectures are aimed to give a general understanding of contemporary energy issues from engineering/technical as well as economical/social points of view. The course is to provide 1st-year students in 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 developments.

※機械、機電整合與智慧機械

本課程的目的在於提供學生對機械的發展與智慧機械的了解，課程將以五週深入淺出課堂講解以及兩週的實際驗證讓學生能夠透過課堂上與教授的雙向交流、以及以三人為一組實際進行 Project Base Learning 製作並測試自驅車和機械手臂，來探究並了解智慧機械的基本組成、以及智慧機械在不同領域的應用和機會。

※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 CES Edupack. This course utilizes a design-lead approach to introduce materials science, then the choice of materials and processes needed to achieve the state of structure for materials in order to obtain desirable 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. The cyber materials selection and design exercise conducted in this course can be related to the module given by Power Mechanical Engineering department, allowing students to understand the interdisciplinary aspects of Materials Science and Engineering.

※最佳化與工業工程

簡介工業工程領域之若干主題，包含作業研究、機率、生產管理、品質管理、網路問題、人因工程、供應鏈管理。另外，深入介紹線性規劃、整數規劃之最佳化技術，及其數學建模之方法與實例應用，並利用套裝軟體實際求解問題。

※Introduction to Sensors and Actuators

Almost all the modern system contains sensors to observe the environment and actuators to influence this environment. An example of such a system is a modern car which during the last decades, precision, comfort and safety are the target of the most important innovations in

the automotive sector, in an attempt to respond to users' higher demands. In this increasing process of automation, technologies such as sensors and actuators take the center stage, indispensable for a vehicle's safety and innovation. It is therefore important to engineers to understand some of the basic principles and technology behind these sensors and actuators so that appropriate designs can be implemented.

There are thousands of different kinds of sensors and actuators. Many of us probably use at least a hundred of them a day. In this course, we will attempt to introduce some basic principles behind the most commonly used types of sensors and actuators as well as introducing some latest novel technologies. Students will learn to demonstrate the physical principles which underly the operation of these sensors and actuators through series of hands-on projects. Along the way, students will learn the design process and associated skills: communicating, creative problem solving, computing, and working in teams. Students also see first-hand how math and science relate to the field of engineering. By taking this class, students gain engineering design experience through hands-on projects and practical oral and written presentation skills, teamwork and possibly working with industry for their final project to demonstrate the skills they learn in class.

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 open-ended 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.

Prerequisite:

There is no actual prerequisite except creativity and willingness to participate in the class projects.

Text:

Reading packets and assignments are available on the course web site: (TBA) Supplemental reading materials will be handed out in class.

Materials:

Students responsible for cost of certain materials for their design projects through course fee or department will provide the materials and supplies.

二、指定用書(Text Books)

無

三、參考書籍(References)

※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

※虛擬材料設計選用

Power-point slides lectures

peer instruction

CES Edupack hands-on exercise

五、教學進度(Syllabus)

※能源

Seven 2-hr lectures:
1. Energy: the foundation of societal prosperity and development
2. Fossil energy: environmental issues, global warming and CO_2 emission.
3. Nuclear energy: reactor types, operational safety and waste storage
4. Wind, hydraulic, geothermal and oceanic energy
5. Solar cells: silicon-based, organic, and dye-sensitized devices
6. Energy storage: secondary batteries
7. Summary: resource availability, cost/gain evaluation, and future prospects

※機械、機電整合與智慧機械

第一週 機械與課程地圖
第二週 機械元件與設計
第三週 熱流力學與能源
第四週 PBL Project I 測試
第五週 機器人與機電整合
第六週 工業 4.0 與智慧製造
第七週 PBL Project II 測試

※虛擬材料設計選用

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

※最佳化與工業工程

1.生產管理
2.供應鏈管理
3.品質管理
4.機率模式與決策方法

5.網路分析
6.線性規劃
7.整數數規劃

※Introduction to Sensors and Actuators

Week1 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 Fundamental of Sensors & Actuators (Introduction to light sources and detectors) Light transceiver project, Nametag project presentation
Week 3 Optical transducer project (Application of light sensor in engineering design, oral and final report in the end of the project)
Week 4 Fundamental of Sensors & Actuators (Introduction to smart structures and materials)
SMA Design project assigned
Week 5 SMA Design project (Application of shape memory alloy actuator in engineering design, oral and final report in the end of the project)
Week 6 Introduction to gear mechanics and light controlled motor control
Week 7 light steered tank battle Competition

六、成績考核(Evaluation)

※能源

In-class question sheets (35%) and final exam (65%).

※機械、機電整合與智慧機械

上課心得: 共五次共佔 30%
PBL Project I: 測試結果 25% 心得報告(ppt) 10%
PBL Project II: 測試結果 25% 心得報告(ppt) 10%

※虛擬材料設計選用

Learning feedbacks (20 %)
Final exam (80 %)

※最佳化與工業工程

Detail to be announced in the first class

※Introduction to Sensors and Actuators

Grading:
Participation – 10% Attendance, journal, projects
Optical Transducer project- 25% SMA project- 25%
Final Project – 40%
Weekly Design project- Extra Credit (max ~ 10% of your final grade)