

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	陳玉彬 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
生物醫學工程	林幸瑩 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

本課程的目的在於加深學生對機械工程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、一週的問題導向學習（PBL, project-based learning）經驗分享、一週的實際驗證，讓學生能夠透過課堂上與教授、學長姊們的雙向交流、以及以三人為一組進行 PBL 實作。評量方式除了紙筆測驗外，也透過全班競爭，測試小組合作 PBL 成果，藉此探究數種機械元件、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未來展望。

※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 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.

※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。

※生物醫學工程

This course provides freshman in the College of Engineering with a global vision of BME-related topics before jumping into professional studies of nanotechnology, materials, devices, manufacturing, genetics, informatics and so on. The 7 lectures are aimed to give an universal understanding of contemporary biomedical issues from engineering/technical as well as economical/social perspectives.

二、指定用書(Text Books)

※機械、機電整合與智慧機械

Lecture notes (課程講義)

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. J. Wickert, *An Introduction to Mechanical Engineering*, Thomson Learning, Inc., 2004.
3. 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

※生物醫學工程

Lecture with slides

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. Yu-Bin Chen (陳玉彬 教授)

Room 512 in Engineering Building I

03-5715131 (ext. 33767)

ybchen@pme.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

※生物醫學工程

On-site or virtual lecture with slides

五、教學進度(Syllabus)

※能源

Introduction to Engineering
 Depletion of fossil fuels and extreme climates
 Fossil, nuclear, and renewable energies
 Energy generation – solar cells
 Energy storage – lithium ion battery, hydrogen economy, fuel cells
 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 機械元件與設計
- 第三週 熱流力學與能源
- 第四週 工業 4.0 與智慧製造
- 第五週 機器人與機電整合
- 第六週 複習週
- 第七週 PBL Project 測試與學長姐 PBL (暫定動機系賽車團隊與機器人團隊) 經驗分享
- 第八週 PBL Project 競賽

※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

※生物醫學工程

70 min lecture with 30 min Q&A

Week	Topic
1,9	Brief course introduction & Medical Internet-of-Things for next generation molecular diagnosis and translational medicine applications
2,10	Bioengineering Strategies for Designing Targeted Cancer Therapies

3,11	Bioengineering strategies for stem cell therapy
4,12	Emerging sensors for healthcare applications
5,13	Optical engineering for plasmonic biosensors
6,14	Bioinorganic engineering for nanomedicine and nanoenzyme
7,15	Medical robotics
8,16	Exam

六、成績考核(Evaluation)

※能源

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

※機械、機電整合與智慧機械

PBL results: 170 (performance and written report)

Tests: 100

Bonus: 30 (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

Learning feedbacks (20 %)

Final exam (80 %)

※最佳化與工業工程

Detail to be announced in the first class

※生物醫學工程

Propose questions 30%

Exam 50%

Attendance 20%

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/>

※生物醫學工程

Links will be delivered by TA