機械系 必/選修 課程簡介－03能源科技組

年級/代號 名稱/學分	中文簡介	英文簡介
二年級 6026 熱力學 3學分	熱力學為一門處理熱與力的基礎科學，並廣泛的被使用於分析能源工程問題上。本課程主要目的讓學生熟悉熱力性質的基本關係、熱力學第一定律及第二定律，並介紹各種不同的熱力循環系統(如蒸氣動力循環系統、氣體動力循環系統及冷凍循環系統等)，讓學生對於各種熱力循環過程有一瞭解，並學習如何分析熱力循環系統的效率，以培養學生具備分析各種熱力工程問題之能力。	Thermodynamics can be defined as the basic science of energy. This can be applied to a wide variety of topics in science and engineering.This course will introduce properties and behavior of pure substances, the first and second laws of thermodynamics, entropy, availability, power cycles(vapor power cycle, gas power cycle, refrigeration cycle) and the basic relation of thermodynamic properties.
三年級 6025 流體力學 3學分	本課程從一些基本原理來強調流體力學的物理概念和分析法，引導學生了解理論和培養基本能力以備能處理流體力學問題。課程內容包含流體靜力學、流力基本定律、系統(system)、控制體積(control volume)、及微分元素分析方法、流體運動學、動力學、流場統禦方程式、不可壓縮無黏性流、因次分析與相似律、內流場、外流場。	This course emphasizes the physical concepts of fluid mechanics and systematic approach to deal with fluid mechanics problems. The content includes fundamental fluid flow concepts; fluid statics; conservation of mass, momentum, and energy in fixed and moving control volumes; Bernoulli's equation; differential analysis of fluid flow; dimensional analysis and similitude; laminar and turbulent flow; boundary layers; lift and drag; applications to mechanical systems
三年級 6033 熱傳學 3學分	熱傳學為處理熱量傳遞速率的一門基礎科學，當二物體有溫差時，熱量即會由高溫物體傳至低溫物體，並藉由傳導、對流與輻射三種模式傳遞。在工程實務應用上，熱傳學在動力系統、冷凍空調系統、電子元件散熱與熱交換器設計上，皆扮演了一個重要角色，本課程主要讓學習者對於熱傳學基礎理論上有一認識，並訓練學生瞭解和建立基本的能力來解決熱傳學問題，進而應用於工程實務上。	Heat transfer is a basic science that deals with the rate of transfer of thermal energy. When the temperature difference is exit between two medium, the transfer of heat is always from the high temperature to the low temperature. Heat can be transferred in three modes: conduction, convection and radiation. The purpose of this course is introduced the basic principles of heat transfer and application for engineering practice to students. The primary objective of this class is to help students understand and develop an orderly approach to heat transfer problem.

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四年級 8800 熱流實驗 1學分	運用熱力學、流體力學、與熱傳學的基本定律來分析並操作相關的機械實驗。包括：橫流式熱交換器、熱膨脹係數、燃料電池、熱傳導、柏努力實驗、雷諾實驗、水柱衝力實驗、強制旋渦、空氣噴嘴性能 、及壓力計校正和流體基本性質量測等實驗。目的在於提供學生動手實驗的機會，培養衛生安全觀念，讓學生經歷認識實驗原理、欣賞實驗設計、學習量測方法、分析數據、解讀結果、和撰寫報告的過程更深刻體認熱流觀念與原理。	are designed to provide practical illustrations of concepts and theories taught in Thermodynamics, Heat Transfer, and Fluid Mechanics classes, and to introduce the students to the basics of experimentation, instrumentation, data collection and analysis, and reporting. The content will include laboratory safety and procedure, and the following experiments:Cross-flow heat exchanger,Thermal expansion of solid, fuel cell system, Bernoulli experiment, Reynold's experiment, Water jet impact measurement, hydrodynamic properties of a forced vortex, heat conduction experiment, nozzle performance test, calibration of a pressure gauge and measurement of fluid properties.
二年級 6670 原動力廠 2學分	本課程接續熱力學基礎，將介紹各種不同的熱力循環系統，如蒸氣動力循環、氣體動力循環及冷凍循環等。課程中將介紹各種熱力循環系統之組成元件、工作原理及分析方式。藉由本課程希望讓學生學習如何利用熱力學所學之理論基礎來進行各種熱力循環系統之分析。	This course will introduce the concepts of power cycles that included vapor power cycle, gas power cycle and refrigeration cycle. The content includes the devices of power cycles, principles of power cycles and analyze of power cycles. That course will help students to utilize the basic of thermodynamics to analyze the power cycles.
三年級 6115 流體機械 2學分	在本系學生學習過熱力學和流體力學之後，開授本課程，以期進一步培養學生應用相關原理於幫浦、風機、壓縮機、輪機等各式工程上常見之流體機械之分析和設計。其中將包含不同流體機械之理想特性、實際特性曲線、及應用之介紹。	This course covers the basic fluid mechanics principles, design procedure, ideal performance characteristics, actual performance curves, application/selection of most types of turbomachines, including pumps , fans, blowers, compressors, and turbines.
三年級 I165 氫能科技概論 3學分	氫能被視為未來可取代石化能源之主要替代能源之一，所以近二十年來氫能技術在全球蓬勃發展。有鑑於此，本課程係將各項氫能技術內容及全球氫能規劃作一分析與說明，以讓學生能了解目前氫能技術發展現況。在本課程中，將全方面地介紹包括氫能重要性、氫的基本性質、氫的各種製取和純化方法、氫的儲存和運輸、氫內燃機、燃料電池、其他氫能應用、氫氣安全等氫能相關議題。	Hydrogen energy is considered one of the major alternative energy technologies for replacing the fossil energy. Thus, the hydrogen energy technology has been flourishing worldwide in recent 20 years. As a result, various hydrogen energy technologies and global hydrogen energy strategies are planned to be introduced in this course to let students understand the status of current hydrogen energy development. Various hydrogen energy related topics, including the importance and urgency of hydrogen energy, basic properties of hydrogen, production and purification of hydrogen, hydrogen storage, hydrogen transmission, internal combustion engines using

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		hydrogen, fuel cells, other hydrogen application systems and hydrogen safety, are planned to be presented in this course.
四年級 8677 電腦輔助熱流分析 3學分	本課程主要在於帶領學生學習以電腦軟體分析熱流問題並學習數值計算原理。讓學生體認熱力學，流體力學和熱傳學理論在分析相關工程問題上的用處。內容包括軟體之使用，問題之界定，數理模式之建立，熱傳導與流場問題之電輔分析，有限體積法介紹。課程將介紹泛用型CFX套裝計算軟體之應用。	1.Objective: to introduce the finite volume method to the students so that they know how to solve mathematical models of the conduction heat transfer and fluid flow related engineering problems. 2. Contents: Applying CFX package to study a conduction heat transfer problem and a fluid dynamics problem, differential governing equations of the problems,discretization methods, structured grid and unstructured grid,appropriate boundary conditions,results analysis.
四年級 C703 冷凍空調原理 3學分	冷凍空調系統的目的在於提供健康舒適的生活環境或產業製程上嚴苛的生產環境，為達到此目標，冷凍空調系統的設計需涵蓋到熱流分析、機械製造與電力電子之綜合技術，牽扯範圍相當廣大。本課程將針對空調負荷的計算、空氣線圖之應用、各種不同之空調系統特性、空調系統規劃與設備選用依據進行介紹，使學習者對於空調系統的設計有一認識與瞭解.	An HVAC system maintains desired environmental conditions in a space. In almost every application, a myriad of options are available to the design engineer to satisfy this basic goal. HVAC systems are categorized by the method used to control heating, ventilation, and air conditioning in the conditioned area.This course will include the basic design theory of HVAC system, the refrigeration system, the ice storage air conditioning system and the HVAC equipments.
四年級 D788 燃料電池 3學分	由於石化燃料的消耗及其對環境的污染，使得近十幾年來不管是學界或是業界紛紛致力於開發新的替代能源，其中以燃料電池的發展最為受到重視。在各式的燃料電池中，又以質子交換膜燃料電池(PEMFCs)的開發最受到矚目及興趣。本課程主要以介紹質子交換膜燃料電池為主，使學生了解基礎的操作原理、內部傳輸現象分析及各關鍵組件之功用。	1. Objective: The depletion of fossil fuels and the degradation of the environment are key issues in modern society. There is an urgent need to substitute fossil fuels by renewable fuels and at the same time find new energy conversion methods that preserve the environment. Because of these problems, much effort has been devoted in recent years to the development of different types of fuel cells. Of these, the polymer electrolyte membrane fuel cells (PEMFCs) has attracted much attention. 2. Contents: Introduction of the basis principle, operation conditions, transport phenomena analysis, and the function of the key components for PEMFCs.

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四年級 1042 綠能與燃燒技術概論 3學分	本課程旨在帶領學生瞭解「無碳」與「永續」之綠色能源技術與國內外技術發展現狀，課程內容包括能源轉換概論、太陽熱能、太陽能電池、風能、氫能與燃料電池、生質能、海洋能、水力與地熱等，以及世界能源體系與綠色能源經濟建構之關聯性，本課程可讓同學初步瞭解綠色能源之技術範疇，作為未來相關技術研發與應用之基礎。	This course intends to familiarize the students with the basic combustion processes and the methods to analyze these processes in various engineering systems. To provide an organized, pedagogical approach to the study of green energy and combustion technology.