

## 機械系 必/選修 課程簡介－02機械設計組

年級/代號 名稱/學分	中文簡介	英文簡介
一年級 <b>6022</b> 應用力學 3/3學分	本課程旨在教導學生應用靜力學及動力學解決工程問題，同時對工程力學的學理及應用有清楚及深入的了解。上學期(靜力學)之主要內容為(1)向量力學原理與應用；(2)力系的質點平衡原理與應用；(3)力系合成與等效力系；(4)力系的剛體平衡原理與應用；(5)結構分析；(6)重心、質心與慣性矩的運用。下學期(動力學)之主要內容包括(1)質點運動學與剛體運動學原理與應用；(2)質點動力學與剛體動力學原理與應用；(3)功能原理；(4)衝量與動量原理。	This course introduces students to the areas of engineering mechanics in view of practical problems. The objective is to provide the student with the ability to apply engineering mechanics to engineering problems and with a clear and thorough understanding of the theory and applications. The topics of statics in 1st semester include (1) force vectors, (2) equilibrium of a particle, (3) force system resultants, (4) equilibrium of a rigid body, (5) structural analysis and (6) center of gravity, centroid and moments of inertia. The topics of dynamics in 2nd semester include (1) kinematics of a particle and a rigid body, (2) kinetics of a particle and a rigid body, (3) work and energy, and (4) impulse and momentum.
一年級 <b>6030</b> 機械製造 3學分	本課程針對機械系學生介紹基本之機械製造工程與原理，使學生於學習之後具有足夠之學識與能力，對日後在機械設計與製造方面：選用材料、製造方法、與生產程序，能針對產品品質、生產力、製造成本作最優化之處置。課程內容包括：材料選用、熱處理、金屬鑄造、金屬加工成形〔軋軋、鍛造、擠形、引伸、金屬板片加工成形、粉末冶金等〕、金屬切削、微電子元件製程、微製造等。	This course introduces basic theories and technology of manufacturing processes. After learning this course, students shall have knowledge and ability to optimize product quality, productivity and manufacturing cost through proper selections of materials and manufacturing processes in mechanical design and manufacturing. Course contents include: material selection, heat treatment, metal casting, metal forming (rolling, forging, sheet-metal forming, extrusion, drawing, powder metallurgy), metal cutting, fabrication of microelectronic devices, and microfabrication.
一年級 <b>6043</b> 工廠實習 1學分	本課程主要讓同學實際動手操作車床、?床及鉗工，並透過工件之製作訓練實作技術，並加深公差與組裝配合之概念。	The main purpose of the present lesson is to let the students to practice the machine tools and cutting machine through the part manufacturing. In addition, the students will be emphasized the concept of "tolerance and assembling fit".

## 機械系 必/選修 課程簡介－02機械設計組

<p>二年級 6029 材料力學 3學分</p>	<p>本課程主要介紹材料受力後之應力及應變行為、應力在不同座標之轉變，並應用這些應力應變理論基礎來分析一些結構件〔包括軸、樑、柱等結構〕之應力應變分析，最後將介紹柱體之屈曲行為及材料之非彈性行為。</p>	<p>The main scope of the present lesson is to introduce the stress and strain behaviors of the solid body under loading. The lessons will include the stress and strain transformation and the structure analysis (rod, truss, shaft, beam etc.) based upon the basic theory of the mechanics of materials. Finally, the buckling of column and inelastic behaviors will be introduced in the present lesson.</p>
<p>二年級 6023 機動學 3學分</p>	<p>本課程旨在讓學生熟悉一般機構之種類、型態及基本運作原理，學習一般機械之基本機構的運動特性之分析方法，並對機構的應用有深入的了解，以為日後學習機械設計奠定理論基礎。主要內容為：一般機械和機構之基本概念；討論一般機械之基本機構，如：四連桿機構、曲柄滑塊機構、凸輪和齒輪等。運用圖解法和解析法來分析其運動特性，包括：速度及加速度求法；凸輪和齒輪的分析與設計；以及齒輪系的設計。</p>	<p>The goal of this course is to familiarize students with various types of mechanisms and their basic principles of operation. In the course students should learn how to analyze the motion of machines and also get profound understanding of the applications of mechanisms. This should lay the foundations for learning Mechanical Design later. Main topics include: basic concepts of mechanisms and machines; basic mechanisms in machinery, such as four-bar linkages, crank-slider mechanisms, cams and gears; graphical and analytical position analysis, velocity analysis and acceleration analysis of mechanisms; design and analysis of cams and gears; design and analysis of drive trains.</p>
<p>二年級 7173 電輔工程圖學 2/2學分</p>	<p>工程圖為工程師在工業界的首要溝通工具。本課程以國家標準為主要規範，講授機械工程圖的繪製以及相關標註，使學生能夠具備識圖及繪圖的能力。繪製訓練包括點、線及面的正投影圖；學習如何用三視圖、輔助視圖及剖面圖等以呈現一個零件或組件；如螺釘、螺帽、齒輪及彈簧等常用零件，則介紹其習用畫法。標註部份包括尺寸、公差、幾何公差及表面符號等。本課程並採用電腦繪圖以輔助教學及製圖。</p>	<p>Engineering graphics is the dominant means to communication among engineers in industry. This course covers mechanical drawing and related marking, and follows the regulation of Chinese National Standard. The students are expected to be able to understand and draw engineering graphs after taking this course. Drawing projection graphs for points, lines and planes as well as presenting a part or an assembly by using orthographic, auxiliary and section views are both included. In addition, the drawing for general mechanical elements, such as bolt, gear, bearing, and spring, is also introduced. Related marking covers dimension, tolerance, geometry tolerance and surface roughness. The CAD software is also adopted in this course for assistance.</p>

## 機械系 必/選修 課程簡介－02機械設計組

<p style="text-align: center;">二年級 <b>6158</b> 機械材料 3學分</p>	<p>本課程將先介紹材料之顯微組織結構與其機械/物理性質之對應關係，再進一步介紹各類主要常用之工程材料，包括：金屬材料、陶瓷材料、聚合體材料、和半導體材料。使學生體認這些材料在機械工業上之重要應用，同時也提供各種加工、製程等科技工藝，使學生熟捻這些材料之製造與如何選用，從而能將材料之選用融入機械設計與製造之領域。本課程將先介紹：晶體結構與缺陷、材料之機械性質、差排與材料強化、材料之損壞與防範、相平衡圖與熱處理等基礎材料科學概念；然後再從材料之晶體結構與機械性質之關係，引導同學認知各類材料之特性與專長應用。</p>	<p>This course first discusses the relationships between the microstructures and the physical/mechanical properties of materials, and then introduces the commonly used engineering materials including alloys, ceramics, polymers, and semiconductor materials. This course teaches students the important applications of such engineering materials in mechanical industry, as well as provides them the technical skills in material processing and selections for machine design and manufacturing. The first part of this course provides the basic material concepts and theories, such as the crystalline microstructures and defects, the mechanical properties of materials, the dislocation and material strengthening, the material failures and prevention, the phase diagrams and heat treatment. The second part introduces the structures, properties, applications and processing of the previously mentioned engineering materials from the viewpoints of the microstructures-characteristics relationships learned from the first part.</p>
<p style="text-align: center;">三年級 <b>D986</b> 機械材料實驗 1學分</p>	<p>本課程首重學生親自動手使用各式試驗儀器與設備，對材料之內部組織與其機械性質，進行一系列之測試與檢驗；並針對不同熱處理對金屬/合金之顯微組織與機械性質之影響，作一系列之評估與探討。實驗內容包括：火花試驗、5項熱處理(完全退火、正常化、球粒化退火、水淬火、回火)、硬度試驗、衝擊試驗、拉伸試驗、疲勞試驗、金相實驗(一)、金相實驗(二)等。</p>	<p>This course emphasizes the hands-on work in using a variety of instruments and testing equipment to measure the mechanical properties and to exam the microstructures of alloys. This course will also study the effects of heat-treatment on the microstructures and mechanical properties of alloys. The experiments include: spark testing, heat treatments (full annealing, normalizing, spheroidizing, water quenching, and tempering), hardness testing, impact testing, tensile testing, fatigue testing, metallographic examination I, and metallographic examination II, etc.</p>
<p style="text-align: center;">三年級 <b>6031</b> 機械設計原理 2/2學分</p>	<p>本課程從基本機械設計程序開始，使學生瞭解設計流程中確認需求、定義問題、綜合、分析、驗證評估等關連性。再介紹各種靜態與疲勞設計理論與方法，接著介紹各種機械元件之作用原理、設計和計算公式與設計規範。使學生熟悉各式機械元件之選用、設計和性能驗證方法，使學生能夠將所學運用到機械系統中元件之設計分析。 課程內容包括:設計簡介、材料、應力及變形分</p>	<p>This course teaches students the fundamentals necessary for designing and analyzing mechanical components and systems. The basic concepts of the design are first discussed. Then the applications of the design principles on the designing of some elements, such as shaft, gear, spring, bolt, bearing, belt, and clutch, are introduced.  The topics include: Introduction to Design; Materials; Stress and Strain; Deflection; Failure Criteria; Fatigue; Design of Machine Elements.</p>

## 機械系 必/選修 課程簡介—02機械設計組

	析、靜態與疲勞設計理論、軸與相關零件的設計、軸承設計、齒輪設計。	
二年級 D791 工業設計概 論 2學分	本課程分為三個部分:第一部分為設計概念，介紹設計理論、人因工程、色彩學等理論課程，第二部分為草繪構圖進行手繪設計，第三部分為電腦輔助設計，俾能提昇工業設計的效率與品質。	This course divides into three parts. The first one is Design Concept, which is about Design Theories, Ergonomics and Chromatics; the second one is Sketch Class; and the last one is Computer-Aided Design. The purpose of this course is to reinforce and upgrade the quality and standard of industrial design
二年級 J637 玩具設計 2學分	以產品設計為課程主體，介紹設計方法與設計流程，並以玩具產品為例，讓學生們體驗各類型玩具的各項特點，萃取出設計元素且強調實作體驗，藉由討論與分組競賽的方式讓學生設計並製作各種玩具產品。	The product design for the course of the main, introduced design methods, design processes, and toy products. So that students experience the characteristics of various types of toys, extract the design elements and emphasize the implementation experience, by discussing with the group competition way for students to design and produce a variety of toy products.
二年級 I884 3D繪圖列 印與實務 2學分	近年來，3D列印產業及其應用市場的蓬勃發展，因此3D列印之繪圖建模及列印技術為重要的發展工具，利用電腦輔助設計之免費軟體SketchUP及外掛套件繪製3D物件，並且搭配3D列印輔助軟體進行物件之模型切片，再運用3D列印設備輸出，課程中也會導入設計思考與CAD/CAM觀念，並以實際設計案例進行討論與分享。	In recent years, the 3D printer of industry and its application market are rapidly developed. Thus, the drawing model and printing technology are considered important tools for the 3D printer. For computer assisted design, using free software of SketchUP and its plug-in suite draw the 3D objects. Moreover, the drawing object is sliced to transfer g-code by 3D printing assisted software. Then, the drawing object could be achieved by 3D printer. In the course, students would be expected to learn how to design and draw the printed object with CAD/CAM concept. Finally, students will share and discuss the printed objects.

## 機械系 必/選修 課程簡介－02機械設計組

<p>三年級 7249 電腦輔助設計 3學分</p>	<p>本課程應用Pro/Engineer軟體，講授三維實體的設計概念。零件設計過程由建立基準面及二維的草繪為起始；繼而以四大基礎特徵(引伸、旋轉、掃瞄、混合)，建構實體模型。此外，並介紹孔、圓角、肋、複製、陣列等工程特性的應用。此外並講授零件的組裝、工程圖的輸出、及簡易機構的運動模擬。學生在此課程中，將可對三維實體模型的設計與相關應用，建立基礎的能力。</p>	<p>The concept of designing 3D solid models is introduced by using Pro/Engineer software. The design starts from building datum and 2D sketch. The 3D models are mainly constructed by using four tools that are “extrude”, “revolve”, “sweep”, and “blend”. Other familiar tools, such as hole, round, rib, copy and array, are covered. Assembling of elements, drawing of engineering graphs, and animation of simple mechanisms are also introduced briefly. After taking this course, students will have basic understanding of designing 3D solid models and related applications.</p>
<p>三年級 H005 CAD與NC程式設計 3學分</p>	<p>本課程為電腦輔助CAD/CAM領域課程，由CAD/CAM設備、幾何模型、CAD標準導入，講授3-D CAD模型建構，以及NC程式設計實務。修課學生可以了解CAD與CAM的關連性，學習運用 Pro/ENGINEER Creo1.0 軟體進行實體建模，教材中並融入「TQC-CA 工程製圖類 CAD APPLICATION – Pro/E專業級」試題，輔導參加TQC電腦技能檢定考試。</p>	<p>This course is a CAD/CAM program in computer aided field. It starts to introduce the CAD/CAM hardware, geometry modeling, CAD standard, and teaches the methodologies for 3-D modeling and NC programming mainly. Students can understand the correlation between CAD and CAM, and practice the solid model construction works using Pro/ENGINEERING Creo1.0. Teaching materials incorporate the examination models of ‘TQC-CA Engineering drawing CAD application - Pro/E professional grade’, and assists students to take the TQC computer skills examination.</p>
<p>三年級 8296 中等動力學 2學分</p>	<p>此課程主要在延伸應用力學二度空間質點及剛體的運動學和動力學，著重在探討三度空間剛體的運動學和動力學，能量及功的原理，衝量與動量的原理，並加強習題演練。主要內容包括(1)剛體運動學原理與應用；(2)剛體動力學原理與應用；(3)功能原理；(4)衝量與動量原理；(5)陀螺儀運動；(6)無扭矩之運動。</p>	<p>This course is centered on three-dimensional kinematics of a rigid body; three-dimensional kinetics of a rigid body: force and acceleration, principle of impulse and momentum, principle of work and energy method; gyroscopic motion; torque-free motion. This course emphasizes on dynamics problem solving.</p>
<p>三年級 A052 機構設計 2學分</p>	<p>設計機構可分形式合成及尺寸合成兩階段。本課程對此做簡略概述。形式合成部分以介紹專利的概念為啟使。介紹由齒輪、彈簧及皮帶等各種機械元件組成之機構與連桿組之關係。探討如何得到俱相同功能之相異機構。討論例為避震器及混合動力車內之行星齒輪系等。尺寸合成對指定功能要求時，簡介機構之合成以及連桿尺度之計</p>	<p>Mechanism design can be mainly divided into two stages: type synthesis and dimension synthesis. For type synthesis, the concept and database of patent are firstly introduced. The relationship between a linkage and a mechanism consisting of various elements, e.g. gear, spring and belt, is introduced. The method to design different mechanisms with the same functions is investigated. Some examples, e.g. suspension systems and planet gear trains used on hybrid vehicle, are given. For dimension synthesis, synthesizing</p>

## 機械系 必/選修 課程簡介—02機械設計組

	算。主要以四連桿為例。	linkage and determining the link lengths to match specified performance or requirement are covered. The design of four-bar is mainly discussed.
三年級 4919 電腦輔助工程 3學分	本課程旨在使學生瞭解電腦輔助工程分析技術及其在機械元件設計分析之應用，教導學生使用電腦輔助工程分析軟體建構模型及分析機械工程問題的基本技巧，以及教導學生應用電腦輔助工程分析以解析機械工程相關課題。課程內容包括有：電腦輔助工程分析方法介紹；線架構、面架構及實體幾何模型之建構；電腦輔助工程分析模型之建立及分析；電腦輔助工程在二維與三維機械工程問題分析之應用。	
四年級 A830 電腦輔助產品設計 3學分	本課程將介紹如何應用Pro/E軟體開發產品之實務技術。授課內容包含：3D實體模型與曲面模型的開發案例實作，建立產品組合圖與產品工程圖。學生分組進行專案設計，並以快速原型機(FDM)或雕刻機製作出產品原型件。並舉辦學生專案設計競賽，藉由此活動激勵創思空間，以達到觀摩與學習的目標。	This course instructs how to apply Pro/E 3-D CAD software to carry out the products development process. Technologies of the 3-D solid model, the 3-D surface model, the product's assembly drawing, and the engineering drawing are introduces in this class. A final project competition will be held by the grouped students, and their designed components can be fabricated by FDM or CNC engraving machines. This activity can simulate students' creative and achieve the goal of inspection and learning.
四年級 6947 有限元素分析 3學分	本課程旨在介紹學生有限元素方法及有限元素軟體的基本概念，教導學生如何應用有限元素分析以解析實務之工程課題，以及教導學生使用商用有限元素軟體建模及分析機械工程問題的基本技巧。課程內容包括有：有限元素方法介紹；一維及二維元素勁性矩陣的推導；桁架、樑、剛架、平面應力與應變等工程問題有限元素應用分析；商用有限元素軟體之電腦輔助有限元素分析應用。	This course introduces students the basic concepts of finite element method and finite element software. It teaches students how to apply the finite element method to solve practical engineering problems. It also teaches students the fundamental skills to model and analyze mechanical problems using commercial finite element software. Topics include introduction to finite element methods; derivations of element stiffness matrices of 1D and 2D elements; finite element analysis on truss, beam, frame and plane stress/strain problems and computer aided finite element analysis using Msc/Nastran software.

## 機械系 必/選修 課程簡介－02機械設計組

<p>四年級 <b>1371</b> 車輛結構設計與製造 3學分</p>	<p>本課程旨在使學生瞭解汽車產業之車體結構的設計概念及製造技術與方法。並以實際工業上之案例分享同學，作為未來相關技術研發及應用之基礎。</p>	<p>This course introduces students to understand the car body structural design concepts and manufacturing methods of the automotive industry. This course enables the students have a preliminary understanding of the context and to practical industrial case studies on students, as the bases for future technology development and application.</p>
<p>四年級 <b>1372</b> 船舶結構設計與強度分析 3學分</p>	<p>本課程旨在使學生瞭解船舶產業中，船體結構之設計概念及分析技術與方法。課程內容包括船舶產業發展狀況、船舶設計流程、相關船級法規要求、船體結構設計之材料選擇、船體結構強度分析、船體結構設計要求基準、共同結構規範其目標導向之安全標準、船體結構動態負荷分析探討、船體結構相關設計與分析案例研討、離岸風電關聯船機現況與技術發展以及船舶產業未來發展趨勢。本課程可讓同學對船舶產業及相關研發技術範疇有初步的認識，並以實際案例加以分享，作為未來相關技術研發及應用之基礎。</p>	<p>This course introduces students to understand the ship structural design concepts and strength analysis technique and methods of the ship industry. Course contents include the industrial development at the current status, ship design process and the class rule requirements for ship design, the material selection, the strength analysis and the design criteria of hull structure, Goal-Based Standard of Common Structural Rule, investigation of dynamic load analysis of hull structure, case study of design and analysis for hull structure, and an introduction to the features and development of offshore support vessel. This course enables the students to the ship industry and technologies have a preliminary understanding of the context and to practical industrial case studies on students, as the bases for future technology development and application.</p>
<p>四年級 <b>8222</b> 結構分析 3學分</p>	<p>本課程主要介紹桁樑 (truss)、柱(Column)、樑(Beam)、等之結構分析，課程會先介紹靜定結構然後靜不定結構，理論和數值分析的方法都將在課堂上教授。</p>	<p>The present class introduces the structure analyses of truss, column, beam etc. The statically determinated structures will be studies first and, then, the statically indeterminated structures will be introduced in the following. Both the theoretical and numerical methods will be taught in the class.</p>