**元智大學 工程學院英語學士班 必選修科目表**

**International Bachelor Program in Engineering at Yuan Ze University**

**List of Required Courses**

**（109學年度入學新生適用）**

**(Applicable to Students Admitted in Academic Year of 2020)**

109.05.06一○八學年度第六次教務會議通過

Passed by the 6th Academic Affairs Meeting, Academic Year 2019, on May 06, 2020

109.11.11 一○九學年度第二次教務會議修訂通過

Amended by the 2nd Academic Affairs Meeting, Academic Year 2019, on November 11, 2020

109.11.11 一○九學年度第二次教務會議修訂通過

Amended by the 2nd Academic Affairs Meeting, Academic Year 2020, on November 11, 2020

110.05.05 一○九學年度第五次教務會議修訂通過

Amended by the 5th Academic Affairs Meeting, Academic Year 2020, on May 05, 2021

111.04.20 一一○學年度第六次教務會議修訂通過

Amended by the 6th Academic Affairs Meeting, Academic Year 2021, on April 20, 2022

111.06.01 一一○學年度第七次教務會議修訂通過

Amended by the 7th Academic Affairs Meeting, Academic Year 2021, on June 01, 2022

111.11.16 一一一學年度第二次教務會議修訂通過

Amended by the 2nd Academic Affairs Meeting, Academic Year 2022, on November 16, 2022

112.04.19 一一一學年度第六次教務會議修訂通過

Amended by the 6th Academic Affairs Meeting, Academic Year 2022, on April 19, 2023

112.05.31 一一一學年度第七次教務會議通過

Amended by the 7th Academic Affairs Meeting, Academic Year 2022, on May 31, 2023

112.11.22 一一二學年度第五次教務會議通過

Passed by the 5th Academic Affairs Meeting, Academic Year 2023, on November 22, 2023

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 學年Academic Year  學期Semester  科目Subject | 第一學年1st Academic Year | | | 第二學年2nd Academic Year | | | | | 第三學年3rd Academic Year | | | | | | 第四學年4th Academic Year | | | | |
| 上Fall | 下Spring | | 上Fall | | | 下Spring | | 上Fall | | | | 下Spring | | 上Fall | | | 下Spring | |
| 共同必修科目University Compulsory  （21） | 國文(一)  Chinese (I)  （2） | 國文(二)  Chinese (II)  （2） | |  | | |  | |  | | | |  | |  | | |  | |
| 英語(一)  English (I)  （2） | 英語(二)  English (II)  （2） | |  | | |  | |  | | | |  | |  | | |  | |
| 程式語言共4學分，依各院修課規則辦理。(開課名稱：基礎程式設計★)  Fundamental Computer Programming is a four-credit course. For those who would like to registered “Fundamental computer programming”, he/she has to meet the college requirement.. (Course Name: Fundamental Computer Programming) | | | | | | | | | | | | | | | | | | |
| 外語課程應依「通識外語修課規定」修習，共計10學分。   1. 「英語（一）」及「英語（二）」為基礎課程，採能力分級上課，共計二學期四學分。 2. 除了「英語（一）」及「英語（二）」外，應修習主題式英語課程三學期5學分，畢業前需修畢三個不同英語課程，始取得畢業資格。大一英語能力後測TOEIC模擬測驗成績未達350分者，應修習「應試加強班」，修習「應試加強班」期間之期末TOEIC模擬測驗成績未達350分者，則該科成績將「不及格」，並應再次修習「應試加強班」，直到取得TOEIC模擬測驗分數達350分(含)始得修習其他主題式英語課程。 3. 另開設「英語檢定」計一學期1學分，「英語檢定」之修課限制與注意事項，請參照「英語檢定」修課規定，並由通識教學部公佈後施行。   外國學生改修華語須經國際語言文化中心審核通過始可改修華語課程10學分，其華語課程10學分應含「華語檢定」1學分，「華語檢定」修課限制與注意事項，請參照「英語檢定」修課規定。  凡本校大學部外國學生(不含交換生)修習「華語一」或「華語二」任一課程成績未達60分，不得修習「華語三」、「華語四」、「華語五」、「華語六」，若修習「華語三」、「華語四」任一課程成績未達60分，不得修習「華語五」或「華語檢定」。  The undergraduate students must complete 10 required credits of foreign language courses as follows:   * English (I), (II): 4 credits * English thematic course: 5 credits * English Test: 1 credit   English (I) and (II) are 4 credits elementary courses for the freshmen who are grouped on English competence-based to complete within two semesters.  English thematic courses are 5-credit of English courses; students are required to obtain  5 credits through 3 different thematic courses for graduation.  For the requirements of registering “English Testing”, please refer to "the Regulation for Registering English Test" announced and implemented by the College of General Education.  Foreign students need approval by ILCC for taking 10 credits of Mandarin Chinese courses as alternative courses of English.  The undergraduate foreign students, exchange students excluded, must score 60 points or higher to pass Mandarin Chinese (I) and (II) before taking Mandarin Chinese (III), (IV), (V), and (VI). Students must score 60 points or higher in Mandarin Chinese (III) and (IV) before taking Mandarin Chinese (V) and (VI).  英語檢定English Testing(1)、經典五十Fifty Canonized Books(2)、服務學習Service Learning(1) | | | | | | | | | | | | | | | | | | |
| 體育Physical Education(0) | 體育Physical Education(0) | | | 體育Physical Education(0) | | | 體育Physical Education(0) | |  | |  | | |  | |  | | |
| 體育除修習大一至大二4個學期外，另需通過「游泳能力檢定」及「心肺適能檢定」等二項檢測，列為畢業門檻。  Beside taking PE courses for 4 semesters (Year 1 to 2), students must pass both swimming and cardiopulmonary function tests. | | | | | | | | | | | | | | | | | | |
| 通識教育科目General Education  (10)★ | 通識課程分為人文藝術、自然科學、社會科學及生命科學四大類。學生須於四大領域中各選修2學分課程，共計8學分。  General Education program comprises four categories：Humanities, Natural Science, Social Science and Life Science. Students are required to take a 2-credit course from each category to get 8 credits before graduation.  通識跨域課程General Education Interdisciplinary Course：工程學院英語學士班學生仍須於四大領域中選課。  Undergraduates of International Programs in the Colleges of Engineering are required to take a 2-credit course from the four categories. | | | | | | | | | | | | | | | | | | |
| 必修科目Department Compulsory  (35)★ | 微積分(一)  Calculus(I)  DE101(3)★ | 微積分(二)  Calculus(II)  DE102 (3)★ | 數量方法  Quantitative Methods  DE202 (3) ★ | | | 工程專題討論(一)  Special Topics in Engineering (I) DE201(2)★ | | | | |  | | | 工程專題討論(二)  Special Topics in Engineering (II)  DE301(2)★ | |  | | |  |
| 基礎程式設計實驗(一)  Computer Programming Lab.(I)  DE103(1)★ | 基礎程式設計實驗(二)  Computer Programming Lab.(II)  DE104(1)★ |  | | |  | | | | |  | | |  | |  | | |  |
| 化工與材科概論  Introduction to Chemical Engineering & Materials Science  DE105(3)★ | 普通物理  General Physics  DE108(3)★ |  | | |  | | | | |  | | |  | |  | | |  |
| 工業工程概論  Introduction to Industrial Engineering  DE106(3)★ | 機械工程概論Introduction to Mechanical Engineering  DE110(3)★ |  | | |  | | | | |  | | |  | |  | | |  |
| 普通化學  General Chemistry  DE107(3)★ | 生技與生醫概論  Introduction to Biotechnology and Biomedicine DE111(3)★ |  | | |  | | | | |  | | |  | |  | | |  |
| 工程圖學  Engineering Drawing  DE211 (2)★ |  |  | | |  | | | | |  | | |  | |  | | |  |
| 學期學分小計Credit each semester | 15 | 13 | 3 | | | 2 | | | | | - | | | 2 | |  | | |  |
| 備註Remarks | 1. 有關共同必修及通識教育科目之詳細規定，另依據「元智大學共同必修科目表」之規定辦理。   Please refer to Yuan Ze University Common Required Course List for General Education course information and regulations.   1. 通識教育科目學分只採計至多10學分，超修之學分將不列入畢業學分。   The maximum credits for general education courses are 10, the exceeding credits will not be counted.   1. 英語授課課程以「★」表示，包含程式語言4學分、通識教育科目10學分、必修科目35學分及領域必修25-42學分。   「★」：The credits granted by English-taught courses include 4 credits from Computer Programming, 10 credits from General Education, 35 credits from the department required courses and 25 to 42 credits from the program required courses   1. 本班必修課程初次修課須在本學程修讀始予承認。   The compulsory courses have to be taken from the International Bachelor Program in Engineering for the first time.   1. 本班同學須自「機械工程」、「化學工程與材料科學」及「工業工程與管理」三個領域中選擇「主修學程」(三選一)或「雙專長學程」(三選二)，並修滿128學分方可畢業。   Students must choose one major as a「single major」from three fields (i.e., Department of Mechanical Engineering, Department of Chemical Engineering and Materials Science, and Department of Industrial Engineering and Management) or complete two sets of these three fields as a 「double major」. Minimum credits for graduation: 128 credits.   * 「主修學程」領域必修/選修科目請參見附表一。(Annex I-「single major」List of Required and Elective Courses) * 「雙專長學程」領域必修/選修科目請參見附表二。(Annex II-「double major」List of Required and Elective Courses)  1. 為增進學生英文能力，鼓勵選修英語授課課程(含英專班)，其修習之課程科目及學分數之認抵需依學系規定辦理。   To improve students’ English, we encourage students to take the courses in English (including English Bachelor), which courses and credits waiver and transference should be standardized by each department.  7. 赴本班所簽訂境外大學修讀雙學位之學生，得申請非本班修讀之必修學分抵免，至多12學分，並於修課前提  出。  Students pursuing a dual degree program at an overseas university partnered with our program may apply for a  maximum of 12 credits of exemption for required courses taken outside our program, and submit an application before  enrolling in the courses | | | | | | | | | | | | | | | | | | |

AA-CP-04-CF02 (1.3 版)／102.04.19 修訂

AA-CP-04-CF05 (1.2 版)／101.11.15 修訂

**【附表一】：「主修學程」領域必修/選修科目表**

**主修學程：機械工程**

**Single major: Mechanical Engineering**

| 學年Academic Year  學期Semester  科目Subject | 第一學年  1st Academic Year | | 第二學年  2nd Academic Year | | 第三學年  3rd Academic Year | | 第四學年  4th Academic Year | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring |
| 必  修  科  目  Compulsory  Courses  (32) |  |  | 工程數學(一)  Engineering Mathematics(I)  DE212 (3)★ | 工程數學(二)  Engineering Mathematics(II)  DE217 (3)★ | 機械設計(一)  Mechanical Design(I)  DE311(3)★ | 機動學  Mechanisms  DE313 (3)★ | 專業實習課程  3選1註3  Internship Courses  (Remarks #3) |  |
|  |  | 熱力學(一)  Thermodynamics (I)  DE213 (3)★ | 材料力學  Mechanics of Materials  DE218 (3)★ | 流體力學  Fluid Mechanics  DE312 (3)★ | 自動控制  Automatic Control  DE314 (3)★ |  |
|  |  | 應用力學-靜力Applied Mechanics Statics  DE216 (3)★ | 機械畫  Mechanical Drawing  DE214(2)★ |  |  | 議題導向實作專題課程註5  Topic and Implementation-oriented courses(3)  (Remarks #5) |  |
| 學期學分小計  Credit each semester | - | - | 9 | 8 | 6 | 6 | 3 | - |
| 選  修  科  目  Elective Courses  (13) |  |  | 機械製造  Introduction to Manufacturing Processes  ME303 (3) | 工程材料  Engineering Materials  ME115(3) | 應用力學-動力  Applied Mechanics Dynamics  ME214(3) | 機械設計(二)  Mechanical Design(II)  ME310(3)★ | 可程式控制  Sequential Programmable Control  ME415 (3) | 太陽能電池  Solar Cell  ME486 (3) |
|  |  | 科技英文閱讀與報告  Technical Reading and Report  DE302(3)★ | 熱力學(二)  Thermodynamics  (II)  ME209(3) | 電路及電子學Introduction to Electric Circuits and Electronics  ME224(3) | 熱傳學  Heat Transfer  ME322(3) ★ | 半年專業實習  Advanced Field Study  ME453 (6) | 電子冷卻技術Electronic Cooling Techniques  ME608(3) ★ |
|  |  | 學術英文  Academic English  DE205(3) ★ | 材料科學  Materials Science  DE121(3)★  ME205(2) | 數值分析  Numerical Analysis  ME345(3) | 機械系統分析  Analysis of Mechanical System  ME386 (3) | 專利分析  Patent Analysis  ME478 (3) | 機電整合  Mechatronics Integration  ME411(3) |
|  |  |  | 綠色人因工程  Green Ergonomics  DE203(3)★ | 綠色能源專題實作  Projects for Green Energy  ME387(3) ★ | 電腦輔助分析  Computer-Aided Engineering Analysis  ME318(3) | 感測器原理與應用  Sensor Principles and Applications  ME385 (3) | 應力分析實務Practice of Stress Analysis  ME476(3) |
|  |  |  | 實驗設計  Experimental Design  DE204(3)★ | 電腦機械繪圖  Computer-Aided Drafting  ME444(3) |  | 可壓縮流學  Compressible Flow  ME601(3)★ | 微機電製程與設備概論  Introduction of the Micro Electro Mechanical Systems: Processes and Facilities  ME471(3) |
|  |  |  |  |  |  | 自動化機械設計  Machine Design Practice  ME441(3) |  |
| 備  註  Remarks | 1. 英語授課課程以「★」表示。「★」shows the course is taught in English. 2. 選修應至少修畢本專長選修科目表課程共計13學分。Students must complete 13 credits for professional elective courses of the Mechanical Engineering program. 3. 專業實習課程需3選1。【暑期專業實習(0)、學士論文(0)、半年專業實習(6)，不限年級皆可修課】。For three courses of “Summer Internship (0) ” ; “Bachelor Thesis (0)” and “Advanced Field Study (6)”, please choose one of the three courses for the required course credits. It’s not required for a grade. 4. 本專長終端學習課程：「機械設計(一)」(DE311)。   The experiential learning course：“Mechanical Design I “ (DE311).   1. 本專長「議題導向實作專題課程」必修3學分(需6選1)【機械系統分析(ME386)、綠色能源專題實作(ME387)、機電整合(ME411)、可程式控制(ME415)、專利分析(ME478) 及自動化機械設計(ME441)】   Analysis of Mechanical System ME386(3), Projects for Green Energy ME387(3), Mechatronics Integration ME411(3), Sequential Programmable Control ME415(3), Patent Analysis ME478(3), Machine Design Practice ME441(3) are courses of 'Topic and Implementation-oriented courses'. Please choose one course for the required course credits.   1. 本專長「數位應用相關課程｣包括：機械畫(DE214)、電腦輔助分析(ME318)、電腦機械繪圖(ME444)、數值分析(ME345)及應力分析實務(ME476)，畢業前須修習至少2門「數位應用相關課程」(可至本班或外系修習)。   Mechanical Drawing DE214 (2)**,** Computer-Aided Engineering Analysis (ME318),Computer-Aided Drafting ME444(3), Numerical Analysis ME345 (3~~) ,~~ Practice of Stress Analysis ME476 (3)  are courses of 'digital application courses'. Students are required to take at least two 'digital application courses'. (Student may take 'digital application courses' from another department.) | | | | | | | |

**主修學程：化學工程與材料科學**

**Single major: Chemical Engineering and Materials Science**

| 學年Academic Year  學期Semester  科目Subject | 第一學年1st Academic Year | | 第二學年2nd Academic Year | | 第三學年3rd Academic Year | | 第四學年4th Academic Year | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring |
| 必  修  科  目  Compulsory  Courses  (30) |  |  | 普通物理(一)  General Physics (I)  DE231 (3)★ | 輸送現象與單元操作(一)  Transport Phenomena and Unit Operations (I) DE235 (3)★ | 輸送現象與單元操作(二)  Transport Phenomena and Unit Operations (II)  DE331 (3)★ | 化學反應工程  Chemical Reaction Engineering DE332 (3)★ | 創新工程系統與元件設計Innovative Engineering System and Component Design  DE431 (3)★ |  |
|  |  | 有機化學(一)  Organic Chemistry (I)  DE232 (3)★ | 材料科學  Materials Science  DE121 (3)★ |  |  |  |  |
|  |  | 物理化學(一)  Physical Chemistry (I)  DE233 (3)★ | 物理化學(二)  Physical Chemistry (II)  DE236 (3)★ |  |  |  |  |
|  |  | 質能均衡  Material & Energy Balance  DE234 (3)★ |  |  |  |  |  |
| 學期學分小計Credit each semester |  |  | 12 | 9 | 3 | 3 | **3** |  |
| 選  修  科  目  Elective Courses  (15) |  |  | 工程數學(一)  Engineering Mathematics(I)  DE212 (3)★ | 有機化學(二)  Organic Chemistry (II)  CH231(3) | 應用生物化學  Applied Biochemistry  CH344(3) | | 高等輸送現象  Advanced Transport Phenomena  CH501 (3) ★ | 高等化工熱力學  Advanced Chemical Engineering Thermodynamics  CH514 (3) ★ |
|  |  | 科技英文閱讀與報告  Technical Reading and Report  DE302(3)★ | 工程數學(二)  Engineering Mathematics (II)  DE217 (3)★ CH233(3) | 化工熱力學  Chemical Engineering Thermodynamics CH304(3) | 複合材料  Composite Materials  CH421(3) | 高等化工動力學  Advanced Chemical Engineering Kinetics  CH503 (3) ★ | 高分子物理  Polymer Physics  CH527 (3) ★ |
|  |  | 學術英文  Academic English  DE205(3) ★ | 計算機程式(一)  Computer Programming (1)  CH115 (3) | 高分子物性  Polymer Physics  CH 336(3) | 輸送現象與單元操作（三）Transport Phenomena and Unit Operations(III)  CH302(3) | 實驗設計  Design for Experimental  CH511 (3) ★ | 物理冶金  Physical Metallurgy  CH617 (3) ★ |
|  |  |  | 電子材料概論  Introduction to Electronic Material  CH222(3) | 光電概論  Introduction to Opto-Electronics  CH346(3) | 生物材料  Biomaterials  CH461(3) | 高等儀器分析  Advanced Instrumental Analysis  CH525 (3) ★ | 無機奈米材料  Inorganic Nanomaterials  CH568 (3) ★ |
|  |  |  | 無機化學  Inorganic Chemistry  CH345(3) | 尖端能源技術  Sustainable Energy Technologies  CH465 (3) | 無機材料  Inorganic Materials  CH448 (3) | 藥物制放特論  Special Topics on Controlled Drug Release  CH535 (3) ★ | 鋰電池材料與製程技術  Materials and Processing of Lithium Battery  CH701 (3) ★ |
|  |  | 普通化學暨分析實驗  General Chemistry & Analysis Laboratory  CH105 (1) | | 專題研究(一)  Research Project (I)  CH335(1) ★ | | 生物技術與基因工程  Biotechnology and Genetic Engineering  BI554(3) | 材料分析技術與應用Technique and Applications of Material Analysis  CH451(3) |
|  |  |  | 綠色人因工程  Green Ergonomics  DE203(3)★ | 物理化學與材料實驗  Physical Chemistry & Materials LaboratoryCH227 (1) | | 高分子加工  Polymer Processing  CH420(3) | 應用電化學  Applied Electrochemistry  CH456(3) |
|  |  |  | 實驗設計  Experimental Design  DE204(3)★ | 微生物學特論  Special Topics in Microbiology  BI507(3) ★ |  |  | 產品與程序設計Product and process design  CH402 (3) |
|  |  |  |  | 細胞生物學  Cell Biology  BI509(3)★ |  |  |  |
|  |  |  |  |  | 分子生物學Molecular Biology BI506(3) ★ |  |  |
| 備註  Remarks | * + - 1. 選修科目至少應選修15學分(含)以上，且此15學分均要求及格。   Complete (Pass) a minimum of 15 credit hours of the elective courses.   * + - 1. 英語授課課程以「★」表示。「★」shows the course is taught in English.       2. 終端學習課程：「創新工程系統與元件設計」(DE431)。   The experiential learning course：“Innovative Engineering System and Component Design” (DE431)   * + - 1. 「創新工程系統與元件設計」課程(DE431)為本專長必修「議題導向實作專題課程」3學分。   “Innovative Engineering System and Component Design” (DE431) is a compulsory three-credit course of "Topic and Implementation-oriented courses".   1. 「材料科學」課程(DE121)、「創新工程系統與元件設計」課程(DE431)為本專長「數位應用相關課程｣，畢業前須通   過至少2門「數位應用相關課程」(可至本班或外系修習)。  “Materials Science” (DE121) and “Innovative Engineering System and Component Design” (DE431) are courses of 'digital application courses'. Students require passing at least two 'digital application courses'. (Student may take 'digital application courses' from another department.) | | | | | | | |

**主修學程：工業工程與管理**

**Single major: Industrial Engineering and Management**

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| 學年Academic Year  學期Semester  科目Subject | 第一學年  1st Academic Year | | 第二學年  2nd Academic Year | | 第三學年  3rd Academic Year | | 第四學年  4th Academic Year | |
| 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring |
| 必  修  科  目  Compulsory  Courses  (25) |  |  | 人因工程(一) Human Factors(I)  DE251(3)★ | 線性代數(含演習) Linear Algebra  DE252(4)★ | 作業研究(一) Operations Research(I)  DE351 (3)★ | 作業研究(二) Operations Research(II)  DE352 (3)★ | 畢業專題(一)  Graduation Project(I)  DE451(3)★ | 畢業專題(二) Graduation Project(II)  DE452(3)★ |
|  |  | 生產計劃與管制(一) Production Planning and Control(I)  DE353 (3)★ | 生產計劃與管制(含實驗)(二) Production Planning and Control(II)  DE354 (3)★ |  |  |  |  |
| 學期學分小計Credit each semester | - | - | 6 | 7 | 3 | 3 | 3 | 3 |
| 選  修  科  目  Elective Courses  (20) | 問題創意思解Creative Problem Solving  IE232 (2) | 工作研究  Work Study  IE211 (3) | 科技英文閱讀與報告  Technical Reading and Report  DE302(3)★ | 網路資訊應用Network Information Application  IE212 (3) | 機率分析Probabilistic Analysis  IE533 (3)★ | 研究方法Research Methodology  IE233 (2) | 全球運籌管理  Global Logistics Management  IE576 (3)★ | 資料視覺  Data Visualization  IE574 (3)★ |
|  |  | 學術英文  Academic English  DE205(3) ★ | 工程溝通Engineering Communications  IE231 (2) | 品質管制(含實驗) Quality Control (Lab)  IE350 (3) | 設施規劃(含實驗) Facilities Planning  IE349 (3) | 實驗設計Experimental Design and Applications  IE538 (3) | 虛擬實境系統設計與建構  Design and Construction of Virtual Reality Systems  IE619 (3)★ |
|  |  |  | 工程統計（二）Engineering Statistics  IE204 (3) | 卓越經營管理  Managing for Business Excellence  IE622(3) ★ | 應用統計分析Applied Statistical Analysis  IE304 (3) | 服務系統設計Service Systems Design  IE581 (3)★ | 存貨系統與管制Inventory Systems and Control  IE517 (3)★ |
|  |  |  | 系統模擬與應用  System Simulation and Applications  IE247(3) | 3D視覺模擬和  虛擬實境  3D Visual Simulation and Virtual Reality  IE562 (3) ★ | 優使性工程Usability Engineering  IE624 (3)★ | 啟發式最佳化Heuristic Optimization  IE607 (3)★ |  |
|  |  |  | 服務工程  Service Engineering  IE245(3) | 專案管理  Project Management  IE375 (3) | 數學規劃（一）  Mathematical Programming (I)  IE507 (3)★ | 模擬學Simulation  IE503(3)★ |  |
|  |  |  | 綠色人因工程  Green Ergonomics  DE203(3)★ |  | 物料管理  Material Management  IE322 (3) | 生產排程Production Scheduling  IE534(3)★ |  |
|  |  |  | 實驗設計  Experimental Design  DE204(3)★ |  |  |  |  |
| 備註Remarks | 1. 選修應至少修畢本專長選修科目表課程共計20學分。   Elective courses should be completed the professional elective courses at least of 20 credits.   1. 英語授課課程以「★」表示。「★」shows the course is taught in English. 2. 終端學習課程：畢業專題(一)、畢業專題(二) 。   The experiential learning courses：”Graduation Project(I)、(II)".   1. 人因工程(一) (DE251)課程為本專長必修「議題導向實作專題課程」3學分。   “Human Factors (I) “(DE251) is a compulsory three-credit course of "Topic and Implementation-oriented courses".   1. 網路資訊應用課程(IE212)、系統模擬與應用(IE247)、模擬學(IE503)、3D視覺模擬和虛擬實境(IE562)、資料視覺 (IE574)及虛擬實境系統設計與建構 (IE619) 課程為本專長「數位應用相關課程｣，畢業前須通過至少2門「數位應用相關課程」(可至本班或外系修習)。   Network Information Application (IE212), System Simulation and Applications (IE247), Simulation (IE503), 3D Visual Simulation and Virtual Reality(IE562), Data Visualization (IE574) and Design and Construction of Virtual Reality Systems (IE619) are courses of 'digital application courses'. Students require passing at least two 'digital application courses'. (Student may take 'digital application courses' from another department.) | | | | | | | |

**【附表二】：「雙專長」領域必修/選修科目表**

**雙專長：機械工程**

**Double major: Mechanical Engineering**

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| 學年Academic Year  學期Semester  科目Subject | 第一學年  1st Academic Year | | 第二學年  2nd Academic Year | | 第三學年  3rd Academic Year | | 第四學年  4th Academic Year | |
| 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring |
| 必  修  科  目  Compulsory  Courses  (24) |  |  | 熱力學(一)  Thermodynamics (I)  DE213 (3)★ |  | 機械設計(一)  Mechanical Design(I)  DE311 (3)★ | 機動學  Mechanisms  DE33 (3)★ | 議題導向實作專題課程註3  Topic and Implementation-oriented courses(3)  (Remarks #3) |  |
|  |  | 工程數學(一)  Engineering Mathematics(I)  DE212 (3)★ |  | 流體力學  Fluid Mechanics  DE312 (3)★ | 自動控制  Automatic Control  DE314 (3)★ |  |
|  |  | 應用力學-靜力Applied Mechanics Statics  DE216 (3)★ |  |  |  |  |
| 學期學分小計  Credit each semester | - | - | 9 | - | 6 | 6 | 3 | - |
| 選  修  科  目  Elective Courses (4) |  |  | 機械製造  Introduction to Manufacturing Processes  ME303 (3) | 工程材料  Engineering Materials  ME115(3) | 應用力學-動力Applied Mechanics Dynamics  ME214(3) | 機械設計(二)  Mechanical Design(II)  ME310(3)★ | 半年專業實習  Advanced Field Study  ME453(6) | 應力分析實務Practice of Stress Analysis  ME476(3) |
|  |  | 科技英文閱讀與報告  Technical Reading and Report  DE302(3)★ | 熱力學(二)  Thermodynamics  (II)ME209(3) | 電路及電子學Introduction to Electric Circuits and Electronics  ME224(3) | 機械系統分析  Analysis of Mechanical System  ME386 (3) | 可程式控制  Sequential Programmable Control  ME415 (3) | 機電整合  Mechatronics Integration  ME411(3) |
|  |  | 學術英文  Academic English  DE205(3) ★ | 材料力學  Mechanics of Materials  DE218 (3)★  ME309 (3) | 數值分析  Numerical Analysis  ME345(3) | 電腦輔助分析  Computer-Aided Engineering Analysis  ME318(3) | 自動化機械設計  Machine Design Practice  ME441(3) |  |
|  |  |  | 機械畫  Mechanical Drawing  DE214 (2)★  ME475 (2) | 綠色能源專題實作  Projects for Green Energy  ME387(3) ★ |  | 專利分析  Patent Analysis  ME478 (3) |  |
|  |  |  | 綠色人因工程  Green Ergonomics  DE203(3)★ | 電腦機械繪圖  Computer-Aided Drafting  ME444(3) |  |  |  |
|  |  |  | 實驗設計  Experimental Design  DE204(3)★ |  |  |  |  |
| 備註  Remarks | 1. 選修應至少修畢本專長選修科目表課程共計4學分。   Students must complete 4 credits for professional elective courses of the Mechanical Engineering program.   1. ~~選修~~英語授課課程以「★」表示。「★」shows the course is taught in English. 2. 本專長終端學習課程：「機械設計(一)」(DE311)。   The experiential learning course：“Mechanical Design I“ (DE311).   1. 本專長「議題導向實作專題課程」必修3學分(需6選1)【機械系統分析(ME386)、綠色能源專題實作(ME387)、機電整合(ME411)、可程式控制(ME415)、專利分析(ME478) 及自動化機械設計(ME441) 】。   Analysis of Mechanical System ME386(3), Projects for Green Energy ME387(3), Mechatronics Integration ME411(3), Sequential Programmable Control ME415(3), Patent Analysis ME478(3), Machine Design Practice ME441(3) are courses of 'Topic and Implementation-oriented courses'. Please choose one course for the required course credits.   1. 本專長「數位應用相關課程｣包括：機械畫(DE214)、電腦輔助分析(ME318)、電腦機械繪圖(ME444)、數值分析(ME345)及應力分析實務(ME476)，畢業前須修習至少2門「數位應用相關課程」(可至本班或外系修習)。   Mechanical Drawing DE214 (2)**,** Computer-Aided Engineering Analysis (ME318),Computer-Aided Drafting ME444(3), Numerical Analysis ME345 (3) , Practice of Stress Analysis ME476 (3)  are courses of 'digital application courses'. Students are required to take at least two 'digital application courses'. (Student may take 'digital application courses' from another department.) | | | | | | | |

**雙專長：化學工程與材料科學**

**Double major: Chemical Engineering and Materials Science**

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| 學年Academic Year  學期Semester  科目Subject | 第一學年  1st Academic Year | | 第二學年  2nd Academic Year | | 第三學年  3rd Academic Year | | 第四學年  4th Academic Year | |
| 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring |
| 必  修  科  目  Compulsory  Courses  (18) |  |  | 物理化學(一)  Physical Chemistry (I)  DE233 (3)★ | 物理化學(二)  Physical Chemistry (II)  DE236 (3)★ |  | 化學反應工程  Chemical Reaction Engineering DE332 (3)★ | 創新工程系統與元件設計Innovative Engineering System and Component Design  DE431 (3)★ |  |
|  |  | 質能均衡  Material & Energy Balance  DE234 (3)★ | 材料科學  Materials Science  DE121 (3)★ |  |  |  |  |
| 學期學分小計Credit each semester | - | - | **6** | **6** |  | **3** | **3** | **-** |
| 選修科目  Elective Courses (9) |  |  | 有機化學(一)  Organic Chemistry (I)  DE232 (3)★  CH230 (3) | 有機化學(二)  Organic Chemistry (II)  CH231(3)★ | 應用生物化學  Applied Biochemistry  CH344(3) | | 高等輸送現象  Advanced Transport Phenomena  CH501 (3) ★ | 高等化工熱力學  Advanced Chemical Engineering Thermodynamics  CH514 (3) ★ |
|  |  | 工程數學(一)  Engineering Mathematics (I)  DE212 (3)★  CH232(3) | 工程數學(二)  Engineering Mathematics (II)  DE217 (3)★  CH232(3) | 化工熱力學  Chemical Engineering Thermodynamics CH304(3) | 複合材料  Composite Materials  CH421(3) | 高等化工動力學  Advanced Chemical Engineering Kinetics  CH503 (3) ★ | 高分子物理  Polymer Physics  CH527 (3) ★ |
|  |  | 科技英文閱讀與報告  Technical Reading and Report  DE302(3)★ | 輸送現象與單元操作(一)  Transport Phenomena and Unit Operations (I) DE235 (3)★  CH218 (3) | 輸送現象與單元操作(二)  Transport Phenomena and Unit Operations (II) DE331 (3)★  CH301 (3) | 輸送現象與單元操作（三）Transport Phenomena and Unit Operations(III)  CH302(3) | 實驗設計  Design for Experimental  CH511 (3) ★ | 物理冶金  Physical Metallurgy  CH617 (3) ★ |
|  |  | 學術英文  Academic English  DE205(3) ★ | 計算機程式(一)  Computer Programming (1)  CH115 (3) ~~★~~ | 高分子物性  Polymer Physics  CH 336(3) | 生物材料  Biomaterials  CH461(3) | 高等儀器分析  Advanced Instrumental Analysis  CH525 (3) ★ | 無機奈米材料  Inorganic Nanomaterials  CH568 (3) ★ |
|  |  |  | 電子材料概論  Introduction to Electronic Material  CH222(3) | 光電概論  Introduction to Opto-Electronics  CH346(3) | 無機材料  Inorganic Materials  CH448 (3) | 藥物制放特論  Special Topics on Controlled Drug Release  CH535 (3) ★ | 鋰電池材料與製程技術  Materials and Processing of Lithium Battery  CH701 (3) ★ |
|  |  |  | 無機化學  Inorganic Chemistry  CH345(3) | 尖端能源技術  Sustainable Energy Technologies  CH465 (3) |  | 生物技術與基因工程Biotechnology and Genetic Engineering  BI554(3) | 材料分析技術與應用Technique and Applications of Material Analysis  CH451(3) |
|  |  |  | 綠色人因工程  Green Ergonomics  DE203(3)★ | 專題研究(一)  Research Project (I)  CH335(1) ★ | | 高分子加工  Polymer Processing  CH420(3) | 應用電化學  Applied Electrochemistry  CH456(3) |
|  |  |  | 實驗設計  Experimental Design  DE204(3)★ | 微生物學特論  Special Topics in Microbiology  BI507(3) ★ |  |  | 產品與程序設計Product and process design  CH402 (3) |
|  |  |  |  | 細胞生物學  Cell Biology  BI509(3)★ |  |  |  |
|  |  |  |  |  | 分子生物學Molecular Biology BI506(3) ★ |  |  |
| 備註  Remarks | 1. 選修科目至少應選修9學分(含)以上，且此9學分均要求及格。   Complete (Pass) a minimum of 9 credit hours of the elective courses.   1. 英語授課課程以「★」表示。「★」shows the course is taught in English. 2. 終端學習課程：「創新工程系統與元件設計」(DE431)。   The experiential learning courses：“Innovative Engineering System and Component Design” (DE431)   1. 「創新工程系統與元件設計」課程(DE431)為本專長必修「議題導向實作專題課程」3學分.   “Innovative Engineering System and Component Design” (DE431) is a compulsory three-credit course of "Topic and Implementation-oriented courses".   1. 「材料科學」課程(DE121)、「創新工程系統與元件設計」課程(DE431)為本專長「數位應用相關課程｣，畢業前須通過至少2門「數位應用相關課程」(可至本班或外系修習)。   “Materials Science” (DE121) and “Innovative Engineering System and Component Design” (DE431) are courses of 'digital application courses'. Students require passing at least two 'digital application courses'. (Student may take 'digital application courses' from another department.) | | | | | | | |

**雙專長：工業工程與管理**

**Double major: Industrial Engineering and Management**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 學年Academic Year  學期Semester  科目Subject | 第一學年  1st Academic Year | | 第二學年  2nd Academic Year | | 第三學年  3rd Academic Year | | 第四學年  4th Academic Year | |
| 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring | 上Fall | 下Spring |
| 必  修  科  目  Compulsory  Courses  (16) |  |  | 人因工程(一) Human Factors(I)  DE251 (3)★ | 線性代數(含演習)  Linear Algebra  DE252 (4)★ | 作業研究(一)  Operations Research(I)  DE351 (3)★ |  | 畢業專題(一) Graduation Project(I)  DE451 (3)★ |  |
|  |  | 生產計劃與管制(一) Production Planning and Control(I)  DE353 (3)★ |  |  |  |  |  |
| 學期學分小計Credit each semester | - | - | 6 | 4 | 3 | - | 3 | - |
| 選  修  科  目  Elective Courses  (12) | 問題創意思解Creative Problem Solving  IE232 (2) | 工作研究  Work Study  IE211 (3) | 科技英文閱讀與報告  Technical Reading and Report  DE302(3)★ | 網路資訊應用Network Information Application  IE212 (3) | 機率分析Probabilistic Analysis  IE533 (3) ★ | 作業研究(二) Operations Research(II)  DE352 (3) ★  IE329(3) | 全球運籌管理  Global Logistics Management  IE576 (3)★ |  |
|  |  | 學術英文  Academic English  DE205(3) ★ | 生產計劃與管制(含實驗)(二) Production Planning and Control(II)  IE354 (3) ★ | 品質管制(含實驗) Quality Control (Lab)  IE350 (3) | 研究方法  Research Methodology  IE233 (2) | 實驗設計Experimental Design and Applications  IE538 (3) |  |
|  |  |  | 工程溝通Engineering Communications  IE231 (2) | 卓越經營管理  Managing for Business Excellence  IE622(3) ★ | 設施規劃(含實驗) Facilities Planning  IE349 (3) | 服務系統設計Service Systems Design  IE581 (3)★ | 資料視覺  Data Visualization  IE574 (3)★ |
|  |  |  | 工程統計（二）Engineering Statistics  IE204 (3) | 3D視覺模擬和  虛擬實境  3D Visual Simulation and Virtual Reality  IE562 (3) ★ | 應用統計分析Applied Statistical Analysis  IE304 (3) | 啟發式最佳化Heuristic Optimization  IE607 (3)★ | 虛擬實境系統設計與建構  Design and Construction of Virtual Reality Systems  IE619 (3)★ |
|  |  |  | 系統模擬與應用  System Simulation and Applications  IE247(3) | 專案管理  Project Management  IE375 (3) | 優使性工程Usability Engineering  IE624 (3)★ | 模擬學  Simulation  IE503(3)★ | 存貨系統與管制Inventory Systems and Control  IE517 (3)★ |
|  |  |  | 服務工程  Service Engineering  IE245(3) |  | 數學規劃（一）  Mathematical Programming (I)  IE507 (3)★ | 生產排程Production Scheduling  IE534(3)★ |  |
|  |  |  | 綠色人因工程  Green Ergonomics  DE203(3)★ |  | 物料管理  Material Management  IE322(3) |  |  |
|  |  |  | 實驗設計  Experimental Design  DE204(3)★ |  |  |  |  |
| 備註Remarks | 1. 選修應至少修畢本專長選修科目表課程共計12學分。   Elective courses should be completed the professional elective courses at least of 12 credits.   1. 英語授課課程以「★」表示。「★」shows the course is taught in English. 2. 終端學習課程：畢業專題(一)   The experiential learning course：”Graduation Project(I)、(II)"   1. 人因工程(一) (DE251)為本專長必修「議題導向實作專題課程」3學分。   “Human Factors (I) “(DE251), is a compulsory three-credit course of "Topic and Implementation-oriented courses".   1. 網路資訊應用課程(IE212)、系統模擬與應用(IE247)、模擬學(IE503)、3D視覺模擬和虛擬實境(IE562)、資料視覺 (IE574)及虛擬實境系統設計與建構 (IE619) 課程為本專長「數位應用相關課程｣，畢業前須通過至少2門「數位應用相關課程」(可至本班或外系修習)。   Network Information Application (IE212), System Simulation and Applications (IE247), Simulation (IE503), 3D Visual Simulation and Virtual Reality (IE562), Data Visualization (IE574) and Design and Construction of Virtual Reality Systems (IE619) are courses of 'digital application courses'. Students require passing at least two 'digital application courses'. (Student may take 'digital application courses' from another department.) | | | | | | | |