**元智大學 化學工程與材料科學學系大學部 必修科目表**

**（111學年度入學新生適用）**

**List of Required Courses for the Undergraduate Program**

**Department of Chemical Engineering and Materials Science, Yuan Ze University**

**(Applicable to Students Admitted in Academic Year of 2022)**

111.04.20 一一○學年度第六次教務會議通過

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

111.09.21 一一一學年度第一次教務會議修訂通過

Amended by the 1st Academic Affairs Meeting, Academic Year 2022, on September 21, 2022

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| --- | --- | --- | --- | --- |
| 學年(Year)學期(Semester)科目(Course) | 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) |
| 外語課程應修習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，畢業前應修畢三個不同主題式英語課程，共三學期5學分。
3. 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」(EL260)。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。
4. 另開設「英語檢定」(EL360)計一學期1學分，「英語檢定」之修課限制與注意事項，請參照「通識外語『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「通識外語『英語檢定』修課規定」。凡本校大學部外國學生修習「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)」。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」(EL372)。The undergraduate students must complete 10 required credits of foreign language courses.1. English (I) & (II) for the total 4 credits: English (I) and (II) are 4 credit elementary courses for the freshmen who are grouped on English competence; to complete within two semesters.
2. English thematic course for the total 5 credits: English thematic courses are 5-credit English courses; students are required to obtain 5 credits through 3 different thematic courses for graduation.
3. Students who do not reach the 350-point threshold of TOEIC Mock Exam in the end of the freshman year must take “English Testing” (EL260) course. Students will fail the course if they do not score higher than 350 points in TOEIC Mock Exam by the end of the course, and must repeatedly take the course until they can score higher than 350 points.
4. “English Testing” (EL360) for the total 1 credit: 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 must pass Mandarin Chinese (I) and (II) before taking Mandarin Chinese (III) and (IV). Students must pass Mandarin Chinese (III) and (IV) before taking Mandarin Chinese (V) and Chinese Proficiency Test (EL372).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） | 興趣選項體育optional physical education（0） | 興趣選項體育optional physical education（0） |  |  |  |  |
| 大學部必須修習4學期體育課程；其中2學期為大一體育課程原班級上課，另2學期為興趣選項體育課程。The undergraduate students must attend the physical education course for 4 semesters; 2 semesters for the freshman physical education courses, the other two semesters for the optional physical education courses. |
| 通識教育科目General Education（10） | 1. 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，包括一門兩學分工程倫理相關課程為必選修，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 with one Ethics course (selective)before graduation.
2. 通識跨域課程General Education Interdisciplinary Course：此2學分學生可自由於通識講座課程、微課自主學習或在地多元文化課群中選課。惟外籍生與工程學院英語學士班、資訊學院英語學士班、人文社會學院英語學士班、電機通訊學院英語學士班學生仍須於四大領域中選課，依各院修課規定辦理。Students can select the 2 credits from a General Education Lecture course, Micro Credit courses, Self-Study courses, or Local-Multicultural courses. Only foreign students and undergraduates of International Programs in the Colleges of Engineering, Informatics, Humanities and Social Sciences, as well as Electrical and Communication Engineering are required to take a 2-credit course from the four categories according to each college’s policy before graduation.(通識4大領域各選修2學分共計8學分(包括一門兩學分工程倫理相關課程為必選修)，其餘2學分之通識跨域課程改為「必選修｣，可於通識講座課程、微課自主學習或在地多元文化課群中選課，亦即不可由四大領域中選課。惟外籍生與四學院英語學士班學生，包括工程學院、資訊學院、人文社會學院、以及電機通訊學院，仍須於四大領域中選課，並依各院修課規定辦理，亦即是否可從四大領域中選課由各院自訂。)
 |
| 系必修科目（83）Required Courses (83) | 普通化學General ChemistryCH103 (3) | 無機化學Inorganic ChemistryCH345 (3) | 有機化學(一)Organic Chemistry (Ⅰ)CH230 (3) | 有機化學(二)Organic Chemistry (Ⅱ)CH231 (3) | 應用生物化學Applied BiochemistryCH344 (3) |  Capstone課程3選11 of 3 courses on the right |
| 儀器分析Instrumental AnalysisCH348 (3) |
| 微積分(一)Calculus (Ⅰ)CH130 (3) | 微積分(二)Calculus (Ⅱ)CH131 (3) | 工程數學(一)Engineering Mathematics (Ⅰ)CH232 (3) | 工程數學(二)Engineering Mathematics (Ⅱ)CH233 (3) | 化工熱力學Chemical Engineering Thermodynamics CH304 (3) | 化學反應工程Chemical Reaction Engineering CH403 (3) | 程序控制Process ControlCH305 (3) | 產品與程序設計Product & Process DesignCH402 (3) |
| 普通物理(一)General Physics (Ⅰ)CH128 (3) | 普通物理(二)General Physics (Ⅱ)CH129 (3) | 物理化學(一)Physical Chemistry (Ⅰ)CH234 (3) | 物理化學(二)Physical Chemistry (Ⅱ)CH235 (3) | 儀器分析實驗Instrumental Analysis LaboratoryCH211 (1) | 創新工程系統與元件設計Innovative Engineering System and Component DesignCH404(3) |  |
| 化工與材科概論Introduction to Chemical Engineering & Materials ScienceCH125 (3) | 材料科學Materials ScienceCH220 (3) | 質能均衡Material & Energy BalanceCH213(3) | 輸送現象與單元操作(一)Transport Phenomena and Unit Operations (I) CH218 (3) | 輸送現象與單元操作(二)Transport Phenomena and Unit Operations (II)CH301 (3) | 固態物理Solid State PhysicsCH355(3) |  |  |
| 普通化學暨分析實驗General Chemistry & Analysis LaboratoryCH105 (1) | 有機與材料化學實驗Organic Chemistry & Materials LaboratoryCH226 (1) | 化工與材料實驗(一)Chemical Engineering & Materials Laboratory(I)CH353 (1) | 化工與材料實驗(二)Chemical Engineering & Materials Laboratory(II)CH354 (1) |  |  |
|  |  | 物理化學與材料實驗Physical Chemistry & Materials LaboratoryCH227 (1) |
|  |  |  | 計算機程式(一)Computer Programming (I)CH115 (3) | 工程經濟Engineering EconomicsCH359(3) | 科技與管理講座Seminar on Technology and Management CH312(2) |  |  |
| 學期學分小計Credits/semeste | 12 | 13 | 13 | 16 | 13 | 13 | 3 | 83Total credits |
| 備註Remarks全文完 | 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 courses 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 is 10, the exceeding credits will not be counted.
2. 「程序控制」、「創新工程系統與元件設計」及「產品與程序設計」為終端學習(Capstone)課程及「議題導向實作專題課程」，須於畢業前至少通過1門課程。”Process Control” (course code CH305), “Innovative Engineering System and Component Design” (course code CH404) and “Product & Process Design” (course code CH402) are the Capstone courses from the department and "Topic and Implementation-oriented courses", students must complete (pass) at least one of them.
3. CH220「材料科學」、CH355「固態物理」、CH305「程序控制」、CH402「產品與程序設計」及CH404「創新工程系統與元件設計」為本系「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」(可至本系或外系修習)。 “Materials Science” (course codeCH220), “Solid State Physics” (course code CH355), “Process Control” (course code CH305) , “Product & Process Design” (course code CH402) and “Innovative Engineering System and Component Design” (course code CH404) are courses of 'digital application courses'. Students require passing at least two 'digital application courses'. (Student may take 'digital application courses' from another department.)
4. 本系同學總共必須修滿 129學分方可畢業，包括共同必修及通識課程共31學分、本系必修83學分，符合本系選修規範之課程至少15學分（外系選修至多承認17學分，與他系合作之學程，依學程規定承認最高學分）。Student must take129 credits in total for graduation, include Required Common Courses and General Education courses (31), Department Compulsory courses (83), and Department Elective courses (15). (Outside the Department of elective up to recognize the (17) credits, and the cooperation courses with other departments, according to the provisions of the highest recognition of credit)
5. 本系必修、選修科目必須在系上修習方予承認，如有特殊原因需至外系修習者，須於選課時經系主任核准，其學分始得承認。Students should not take undergraduate courses from other departments or institutes to be counted as the required courses from the department unless being approved by the department chair.
6. 除了補修低年級必修科目之外，本系實驗課以隨班上課為主。Students must take the experimental courses at the time arranged by the department unless taking the required courses, which were failed previously, in the lower-level classes.
7. 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.
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**元智大學 化學工程與材料科學學系大學部 選修科目表**

**（111學年度入學新生適用）**

**List of Elective Courses for the Undergraduate Program**

**Department of Chemical Engineering and Materials Science, Yuan Ze University**

**(Applicable to Students Admitted in Academic Year of 2022)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 學年Year學期Semester科目Course | 第一學年(1st Year) | 第二學年 (2nd Year) | 第三學年 (3rd Year) | 第四學年 (4th Year) |
| 上學期(Fall Semester) | 下學期(Spring Semester) | 上學期(Fall Semester) | 下學期(Spring Semester) | 上學期(Fall Semester) | 下學期(Spring Semester) | 上學期(Fall Semester) | 下學期(Spring Semester) |
| 核心科目Core course | 必選科目二 (右側課程4選1）Required Elective course (Ⅱ) (1 of 4 courses on the right) | 專題研究(一)Research Project (I)CH335 (1) | 專業實習Field StudyCH445 (3) |  |
| **實作專題(**一**) ~實作專題(二)****Undergraduate thesis (1)(2)****CH360(3)、CH361(3)**  |
| 工廠實習Plant Practice CH446 (1) |  |
| 綠色科技學程Green Science and Technology |  |  | **化學安全工程****Damage Prevention for Chemical Engineering****CH443 (3)** | 智慧生產概論Introduction to Intelligent Production EG201(3) | **尖端能源技術****Sustainable Energy Technologies****CH465 (3)** | **輸送現象與單元操作（三）Transport Phenomena and Unit Operations(III) CH302(3)** | **工程管理****Engineering Management****CH440 (3)** | **應用電化學****Applied Electrochemistry****CH456 (3)** |
|  |  |  |  | 綠色化學Green ChemistryME494 (3) | 工程統計與數據處理Engineering Statistics and Data AnalysisCH357 (3) | **奈米科技****Nanotechnologies****CH460 (3)** | 薄膜分離技術Membrane SeparationsTechnologyCH520 (3) |
|  |  |  |  |  | **化學工業特論****Special Topics on Chemical Industry****CH435 (3)** | 燃料電池概論Introduction to Fuel Cell TechnologyME483 (3) | 統計實驗設計與應用Statistical Experimental Design and ApplicationEG501 (3) |
|  |  |  |  |  | 太陽能電池Solar CellME486 (3) | **印刷電路板製程Printed Circuit Board Processing CH340 (3)** |  |
|  |  |  |  |  |  | 專題研究(二)Research Project (Ⅱ)CH342(1) |
| 功能性材料學程Functional Materials |  |  | 電子學(一)EE205CN201EO204 (3) | **電子材料概論****Introduction to Electronic Material****CH222 (3)** | **半導體製程****Semiconductor Processing****CH334 (3)** | **複合材料****Composite Materials****CH421 (3)** | **印刷電路板製程Printed Circuit Board Processing CH340 (3)** | **材料分析技術與應用Technique and Applications of Material Analysis****CH451 (3)** |
|  |  |  | **高分子聚合****Polymerization****CH339 (3)** | **高分子物性****Polymer Physics****CH336 (3)** | 工程統計與數據處理Engineering Statistics and Data AnalysisCH357 (3) | **高分子加工****Polymer Processing****CH420 (3)** | **應用電化學****Applied Electrochemistry****CH456 (3)** |
|  |  |  | 智慧生產概論Introduction to Intelligent Production EG201(3) | **光電概論****Introduction to Opto-Electronics****CH346 (3)** | **化學工業特論****Special Topics on Chemical Industry****CH435 (3)** | **工程管理****Engineering Management****CH440 (3)** | 薄膜分離技術Membrane SeparationsTechnologyCH520 (3) |
|  |  |  | **無機材料****Inorganic Materials****CH448 (3)** | **尖端能源技術****Sustainable Energy Technologies****CH465 (3)** | **生物材料****Biomaterials****CH461 (3)** | **奈米科技Nanotechnologies****CH460 (3)** |  |
|  |  |  |  | 綠色化學Green ChemistryME494 (3) | 太陽能電池Solar CellME486 (3) | 燃料電池概論Introduction to Fuel Cell TechnologyME483 (3) |  |
|  |  |  |  |  |  | 磁性材料概論Introduction to Magnetic MaterialsCH625 |  |
|  |  |  |  |  |  | 專題研究(二)Research Project (Ⅱ)CH342(1) |
| 生物技術學程Biotechnology |  |  | **細胞生物學(一)****Cell Biology (I)****CH228 (2)** | **細胞生物學(二)****Cell Biology (II)****CH229 (2)** | **生化工程****Biochemical Engineering****CH333 (3)** | **基礎生物技術****Basic Biotechnology****CH347 (3)** | **工程管理****Engineering Management****CH440 (3)** | **應用電化學****Applied Electrochemistry****CH456 (3)** |
|  |  |  | **工業微生物****Industrial Microbiology****CH349 (3)** | **藥物化學與藥理概論****Introduction of medicinal chemistry and pharmacology****CH358(3)** | 生化分離Bio-separationsCH356 (3)  | **奈米科技Nanotechnologies****CH460 (3)** | **製藥技術工程****Pharmaceutical Engineering****CH579 (3)** |
|  |  |  | 智慧生產概論Introduction to Intelligent Production EG201(3) |  | 工程統計與數據處理Engineering Statistics and Data AnalysisCH357 (3) | 環境生物技術Environmental BiotechnologyCH586 (3) | 薄膜分離技術Membrane SeparationsTechnologyCH520 (3) |
|  |  |  |  |  | **化學工業特論****Special Topics on Chemical Industry****CH435 (3)** | 藥物制放特論Special Topics on Controlled Drug ReleaseCH535 (3) |  |
|  |  |  |  |  | **生物材料****Biomaterials****CH461 (3)** | 專題研究(二)Research Project (Ⅱ)CH342(1) |
| 實作學程undergraduate thesis program |  |  |  |  | **實作專題(一)****Undergraduate thesis (1)****CH360(3)** | **實作專題(二)****Undergraduate thesis (2)****CH361(3)** | **實作專題(三)** **Undergraduate thesis (3)****CH362(3)** | **實作專題(四)****Undergraduate thesis (4)****CH363(3)** |
| 備註 | 1. 專題研究（一）不及格不得選修專題研究（二）；專題研究（二）僅得認列一學程，由專題指導教授簽核認可。The pass of Research Project (I) is mandatory before taking the Research Project (Ⅱ).
2. 選修分為五種方式，由同學自由擇一方式完成： The elective courses can be taken with five different methods. Students can choose any one of them to fulfill the requirement of the department.

(1) 完成一個系選修學程：該學程內至少須選修15學分(含)以上，且此15學分均要求及格，其中並包含該學程之核心課程：Complete one of the following programs: Complete (Pass) at least 15 credit hours (including the two of the three core courses listed (courses with the shaded mark)) of the chosen program. (A)【綠色科技學程】 ⮞尖端能源技術、輸送現象與單元操作（三）、化學工業特論（三選二）Green Science and Technology Program: “Sustainable Energy Technologies”, “Transport Phenomena and Unit Operations(III)”, and “Special Topics on Chemical Industry” (choose 2 of 3) (B)【功能性材料學程】⮞ (a)高分子聚合、高分子物性、高分子加工（三選二） (b)電子材料概論、光電概論、無機材料（三選二）[(a)或(b)擇一]Functional Materials Program: [choose (a) or (b)](a) “Polymerization”, “Polymer Physics”, and “Polymer Processing”. (choose 2 of 3) (b) “Introduction to Electronic Material”, “Introduction to Opto-Electronics”, and “Inorganic Materials”. (choose 2 of 3)(C)【生物技術學程】 ⮞細胞生物學（一）、生化工程、基礎生物技術（三選二）Biotechnology Program: “Cell Biology (I)”, “Biochemical Engineering”, and “Basic Biotechnology”. (choose 2 of 3)(2) 完成二個選修學程：選擇二個學程，在每一學程內必須各選修12學分(含)以上，但選修課程至少須12學分及格。若一門課跨二個學程以上，則只能擇一學程計算。Take at least 12 credits from each of the two chosen programs, and complete (pass) at least 12 credits. The credits of the course listed in multi programs can be only singly counted.(3) 完成一個跨領域學程，該學程內至少須選修15學分(含)以上，不含本系必修課程之學分，且獲得學程證書者。（請參考教務處網頁）Complete one of the interdisciplinary programs from University: Complete (Pass) at least 15 credits from the chosen program. (See the website of Office of Academic Affairs: <https://www.yzu.edu.tw/admin/aa/index.php/tw/2016-01-14-06-58-46/2016-03-13-13-02-53/interdisciplinary-course-program> )(4) 完成本系實作學程15學分，其中12學分為實作專題(一)~(四)，另3學分須通過上述三學程其中一選修課程。 Complete 12 credits of the undergraduate thesis program and 3 credits from the other programs. (5)為增加同學多元學習之機會，提升就業能力及開闊生涯規劃，經導師同意後可跨至其他學系、學院修課，最多承認17學分(此17學分不得為通識教育科目學分)。To improve the multidiscipline learning, enhance the employability, and broaden the career planning, a maximum of 15 credits taken from other departments and colleges would be accepted after approved by the tutor. (\*The general education courses are excluded.)1. CH開頭之課程為本系所開課課程。The courses beginning with the “CH” course number are offered by the department.
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