

# 國立中興大學 通識課程 教學大綱

課程名稱 course name	先進智慧醫材				
	Advanced Smart Medical Devices				
開課系所班級 dept. & grade	通識教育中心 General Education Center	學分 credits	3	規劃教師 teacher	楊明德、張健忠、何孟書
課程屬性 course type	必修 required	授課語言 language	中文或英文 Chinese/English	開課學期 semester	上或下 fall or spring
課程分類 course classification	109 學年度前入學新生適用		自然領域－工程科技學群		
	110 學年度起入學新生適用		統合領域－專業實作		
課程簡述 course description	<p>本課程旨在教導學生如何結合智慧科技與高齡照護，透過跨學科的學習，了解與開發適合高齡者的智慧穿戴裝置和感測器。學生將學習微電腦晶片的控制（以 Arduino 為課程主體），並搭配感測器原理教學及其應用與韌體連網、雲端運算等實作。本課程著重於實際操作與理論知識的結合，使學生能進行跨領域的討論，發掘高齡者日常生活之挑戰，並設計運用工程技術，來將生理數據透過雲端技術傳輸，並搭配人工智能建立數據分析模型，旨在提升高齡者生活品質，解決其日常所面臨的挑戰。</p> <p>The concept of teach students how to integrate smart technology with elderly care through interdisciplinary learning. Students will understand and develop suitable smart wearable devices and sensors for older adults. The course will focus on controlling microcontroller chips, primarily using Arduino, along with teaching sensor principles, applications, firmware networking, and cloud computing. Emphasizing the combination of practical operation and theoretical knowledge, students will engage in interdisciplinary discussions to identify challenges faced by older adults in their daily lives. They will design engineering solutions to transmit physiological data through cloud technology and utilize artificial intelligence to establish data analysis models, with the goal of enhancing the quality of life for the elderly and addressing the challenges they encounter.</p>				
教學目標 course objectives	<ol style="list-style-type: none"> <li>1. 分析高齡化趨勢，理解高齡者的特徵與需求。</li> <li>2. 探討與設計符合高齡者使用的輔具與智慧科技應用。</li> <li>3. 學習微處理器的開發環境設置與基本程式語法控制（以 Arduino 為例）。</li> <li>4. 熟悉微處理器搭配感測器應用與電子元件控制（以 Arduino 為例）實作物聯網與雲端數據傳輸，並結合 AI 進行數據分析。</li> <li>5. 評估商品化潛力與市場趨勢，加強醫療產品開發與創新思維。</li> <li>6. 透過小組合作與使用者測試，實際體驗產品開發過程與挑戰。</li> <li>7. 進行期末成果發表，並透過競賽形式激發創新與解決問題的能力。</li> </ol>				

	<ol style="list-style-type: none"> <li>1. Analyze the aging trend to understand the characteristics and needs of the elderly.</li> <li>2. Explore and design assistive devices and smart technology applications suitable for older adults.</li> <li>3. Learn to set up the development environment for microprocessors and basic programming syntax control (using Arduino as an example).</li> <li>4. Familiarize yourself with microprocessor applications in conjunction with sensors and electronic component control (using Arduino as an example). Implement Internet of Things (IoT) and cloud data transmission, integrating AI for data analysis.</li> <li>5. Evaluate commercialization potential and market trends to enhance medical product development and innovative thinking.</li> <li>6. Through group collaboration and user testing, gain practical experience in the product development process and its challenges.</li> <li>7. Conduct a final presentation of results, utilizing a competitive format to stimulate innovation and problem-solving skills.</li> </ol>				
<b>先修課程 prerequisites</b>	無 None				
<b>六項核心能力配比（加總為 100%） The 6 core learning outcomes add up to 100%</b>					
人文素養	科學素養	溝通能力	創新能力	國際視野	社會關懷
10%	20%	30%	20%	10%	10%
Humanities Literacy	Scientific Literacy	Communication Skills	Innovative Ability	International Perspective	Social Concerns
<b>教學方法 teaching methods</b>			<b>學習評量方式 evaluation</b>		
課堂講授與實地場域參訪 Lectures and Visiting			出席率 Attendance 20% 課堂作業或報告 Homework or Reports of Lectures 40% 團體報告 Teams Reports 40%		
<b>授課內容（單元名稱與內容、習作/考試進度） course contents and homework/tests schedule</b>					
1	課程介紹				
2	高齡化趨勢分析與高齡者特徵				
3	醫療科技於高齡社會之介紹與設計				
4	聯合骨科／泰陞公司／生醫旗艦館－南科參訪+學長姐問答				
5	常見的普化高齡科技				
6	Arduino 介紹與開發環境設置				
7	創業投資 創新醫材經營模式 Panel Discussion-創業經驗分享 HTC 元宇宙產品在醫學的應用 業師 Round Table				

	8	Arduino 的基本程式語法與控制	
	9	Arduino 的電子元件控制	
	10	Arduino 感測器控制	
	11	物聯網與雲端運算(以 Arduino 為例)	
	12	AI 運算(I)	
	13	AI 運算(II)-英文授課	
	14	商品化與市場趨勢分析	
	15	小組開發進度分享	
	16	使用者測試	
	17	期末成果發表競賽 需有成品	
	18	成果發表	
<b>教科書與參考書目 (書名、作者、書局/代理商...)</b> <b>textbooks &amp; other references (title, author, publisher...)</b>			
1. Henry Baltes, Oliver Brand, Gray K. Fedder, Christofer Hierold, Jan G. Korvink, Osamu Tabata, <i>Enabling Technologies for MEMS and Nanodevices (Advanced Micro and Nanosystems)</i> , 2004, Wiley-VCH. 2. E. Meng, <i>Biomedical Microsystems</i> , 2010, CRC Press.			
<b>課程教材 (教師個人網址請列在本校內之網址)</b> <b>teaching aids &amp; teacher's website</b>			
Arduino			
<b>課程輔導時間</b> <b>office hours</b>			
另行公告			

※本課程如符合下列主題項目，請勾選 (可複選)：

Please select based on the actual course content and can choose multiple options.

<input type="checkbox"/> 氣候變遷 Climate Change	<input type="checkbox"/> 淨零排放 Net Zero Emissions
<input type="checkbox"/> 永續發展 Sustainable Development	<input type="checkbox"/> 永續環境(USR) Sustainable Environment (USR)
<input type="checkbox"/> 在地關懷(USR) Local Care (USR)	<input type="checkbox"/> 產業鏈結與經濟永續(USR) Industrial Linkages and Economic Sustainability (USR)
<input type="checkbox"/> 健康促進(USR) Health Promotion (USR)	<input type="checkbox"/> 食品安全(USR) Food Safety (USR)
<input type="checkbox"/> 文化永續(USR) Cultural Sustainability (USR)	<input type="checkbox"/> 其他社會實踐(USR) Other Social Practices (USR)

<input type="checkbox"/> 情緒管理 Emotional Management	<input type="checkbox"/> 性別平等 Gender Equality
<input type="checkbox"/> 人文關懷 Humanistic Care	<input type="checkbox"/> 生命教育 Life Education
<input type="checkbox"/> 資訊安全 Information Security	<input type="checkbox"/> 資訊科技 Information Technology
<input type="checkbox"/> 資訊判讀 Information Literacy	<input type="checkbox"/> 媒體識讀 Media Literacy
<input type="checkbox"/> 臺灣文學 Taiwanese Literature	<input type="checkbox"/> 智慧財產 Intellectual Property
<input type="checkbox"/> 實作 Implementation	<input type="checkbox"/> 行動導向 Action-oriented
<input type="checkbox"/> 跨域 Interdisciplinary	<input type="checkbox"/> 走讀台中山水遊學 Study Tour of Taichung's Landscape
<input type="checkbox"/> 空間綠化設計 Space Greening Design	<input type="checkbox"/> 生活環境創意美學 Creative Aesthetics of Living Environment

※UCAN (課程內容有符合者，才需勾選) 【可複選】

UCAN (Check only if the course content is relevant) [Multiple selections allowed]

<input type="checkbox"/> 創新 Innovation	<input type="checkbox"/> 持續學習 Continuous Learning
<input type="checkbox"/> 問題解決 Problem Solving	<input type="checkbox"/> 團隊合作 Teamwork
<input type="checkbox"/> 人際互動 Interpersonal Interaction	<input type="checkbox"/> 溝通表達 Communication Skills
<input type="checkbox"/> 工作責任及紀律 Work Responsibility and Discipline	<input type="checkbox"/> 資訊科技應用 Information Technology Application

※STEAM (課程內容有符合者，才需勾選) 【可複選】

STEAM (Check only if the course content is relevant) [Multiple selections allowed]

<input type="checkbox"/> 科學 Science	<input type="checkbox"/> 科技 Technology
<input type="checkbox"/> 工程 Engineering	<input type="checkbox"/> 數學 Mathematics
<input type="checkbox"/> 藝術 Arts	

※聯合國全球永續發展目標 (授課教師可依實際課程內容勾選，可複選)

Sustainable Development Goals, SDGs (Teachers may select based on the actual course content and can choose multiple options.)

<input type="checkbox"/> 1. 消除貧窮	<input type="checkbox"/> 1. No Poverty
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<input type="checkbox"/> 2. 消除飢餓	<input type="checkbox"/> 2. Zero Hunger
<input type="checkbox"/> 3. 健康與福祉	<input type="checkbox"/> 3. Good Health and Well-Being
<input type="checkbox"/> 4. 教育品質	<input type="checkbox"/> 4. Quality Education
<input type="checkbox"/> 5. 性別平等	<input type="checkbox"/> 5. Gender Equality
<input type="checkbox"/> 6. 淨水與衛生	<input type="checkbox"/> 6. Clean Water and Sanitation
<input type="checkbox"/> 7. 可負擔能源	<input type="checkbox"/> 7. Affordable and Clean Energy
<input type="checkbox"/> 8. 就業與經濟成長	<input type="checkbox"/> 8. Decent Work and Economic Growth
<input type="checkbox"/> 9. 工業、創新基礎建設	<input type="checkbox"/> 9. Industry, Innovation and Infrastructure
<input type="checkbox"/> 10. 減少不平等	<input type="checkbox"/> 10. Reduced Inequalities
<input type="checkbox"/> 11. 永續城市	<input type="checkbox"/> 11. Sustainable Cities and Communities
<input type="checkbox"/> 12. 責任消費與生產	<input type="checkbox"/> 12. Responsible Consumption
<input type="checkbox"/> 13. 氣候行動	<input type="checkbox"/> 13. Climate Action
<input type="checkbox"/> 14. 海洋生態	<input type="checkbox"/> 14. Life Below Water
<input type="checkbox"/> 15. 陸地生態	<input type="checkbox"/> 15. Life on Land
<input type="checkbox"/> 16. 和平與正義制度	<input type="checkbox"/> 16. Peace and Justice
<input type="checkbox"/> 17. 全球夥伴	<input type="checkbox"/> 17. Partnerships for the Goals
<p>請填寫與課程最相關之上列已勾選 SDGs 目標序號：_____ (無勾選者則免填)</p> <p>Please fill in the selected SDG goal most relevant to the course: _____ (If no goals have been selected, please leave blank.)</p>	