

國立中興大學 通識課程 教學大綱

Syllabus of NCHU General Education Course

課程名稱 course name	進階智慧檢測技術				
	Advanced Smart Sensing Technology				
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	醫工所 林淑萍
課程屬性 course type	必修 compulsory	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>智慧檢測是一項新興技術，可用於醫療保健監控和工業應用等各種應用。智慧檢測系統由多個感測器組成，這些感測器從生理環境收集輸入，根據收集到的輸入執行特定任務。智慧型感測器發展需要符合相關安全規定，以確保使用者正常操作以量取相關生理參數訊號。智慧型感測器包括用於將物理量轉換為電量的感測器、用於增強原始資訊的放大器、用於去除不需要的訊號的類比濾波器、最後用於補償過程的補償器。除此之外，智慧檢測系統還處理一些基於軟體的功能，例如收集、處理以及與設備通訊。智慧感測器可以透過收集的資訊，並以最少的雜訊來產生準確的數據。另外，不同的網路可用於傳輸訊息，可以監視整個過程，然後自行採取必要的控制措施。</p> <p>智慧檢測技術和設備開發對解決未來 10 至 30 年間的臨床疾病診斷、老年健康照護、精準醫療等相關議題扮演關鍵性的角色。舉凡 2019 年發生之 COVID-19 冠狀病毒疫情控制、非洲豬瘟之防治、液蛋沙門氏桿菌汙染排除…等事件，均仰賴及時、準確、高效率、高性價比、高機動性之智慧檢測技術和設備開發而達成。隨著智慧穿戴裝置(智慧手表、智慧手機…等)、物聯網 (internet of things, IoT)、人工智慧 (artificial intelligence, AI)、奈米複合材料…等新技術和趨勢誕生，使智慧檢測技術和設備開發又邁入一個具有無限潛能的新領域。</p>				
	<p>Smart sensing is an emerging technology that is used in various applications like healthcare monitoring and industrial applications. Smart sensing system consists of the number of sensors that collects input from the physical environment to do a specific task based on the collected inputs. The development of smart sensors needs to comply with relevant safety regulations to ensure the normal operation of users and the accurate measurement of relevant physiological parameter signals. The process can be carried out before the data passed to it. The smart sensor includes transducer that is used to covert physical quantitatively into electrical quantity, an amplifier that is used to strengthen the original information, analog filter that is used to remove the unwanted signals, and finally compensator is used to compensate the process. Additional to that, some software-based functions are also processed like collecting, processing, and communicating with the device. Smart sensors can produce accurate data with the least amount of noise which is captured by the collected information. It can keep an eye on the entire process and then taking the necessary control action by itself.</p>				

<p>教學目標 course objectives</p>	<p>本課程目標為讓學生學習如何將奈微製程技術結合智慧科技之知識與技術。課程將藉由精密微製程到奈米製程之發展過程，來介紹感測器之基礎設計概念，並藉由軟體控制的功能，設計智慧量測生理感測器與安全法規。本專業跨領域課程之目標為以系統化多單元講授方式連結上述新知識於智慧檢測技術和設備開發之應用，內容涵蓋智慧檢測相關技術研發特性介紹、奈米複合生物晶片和微流道晶片介紹、可攜式檢測平台設計與運作、頻譜資料影像化、大數據分析等新興領域。</p> <p>The objective of this course is to allow students to learn how to combine micro/nanofabrication to fabricate sensors and learn how to integrate the knowledge, skills, and safety regulations of smart technology with sensors. The course will introduce the basic design concepts of sensors through the development process from precision micro-fabrication to nano-fabrication, and design intelligent measurement physiological sensors through software control functions.</p>				
<p>先修課程 prerequisites</p>	<p>無 None</p>				
<p>六項核心能力配比（加總為 100%） The 6 core learning outcomes add up to 100%</p>					
<p>人文素養</p>	<p>科學素養</p>	<p>溝通能力</p>	<p>創新能力</p>	<p>國際視野</p>	<p>社會關懷</p>
<p>0%</p>	<p>30%</p>	<p>30%</p>	<p>30%</p>	<p>10%</p>	<p>0%</p>
<p>Humanities Literacy</p>	<p>Scientific Literacy</p>	<p>Communication Skills</p>	<p>Innovative Ability</p>	<p>International Perspective</p>	<p>Social Concerns</p>
<p>教學方法 teaching methods</p>			<p>學習評量方式 evaluation</p>		
<p>課堂講授、實地場域參訪與實作 Lectures, Visiting and Exercises</p>			<p>出席率 Attendance 5% 課堂小考、作業或報告 Quizzes, Homework or Reports of Lectures 50% 實地場域參訪 Visiting 15% 實驗操作 Experimental Exercise 30%</p>		
<p>授課內容（單元名稱與內容、習作/考試進度） course contents and homework/tests schedule</p>					
<p>週次</p>	<p>講題</p>				
<p>1-2</p>	<p>智慧檢測定點照護檢驗(POCT)感測器 (Smart Point-of-Care Testing (POCT) Sensor)</p>				
<p>3-5</p>	<p>細胞為基底之感測器，奈微米生醫感測器，電晶體生醫感測器 (Cell-Based Biosensors, Nano-/Micro-scale Biomedical Sensors, Field-Effect Transistor-Based Biosensors)</p>				
<p>6</p>	<p>醫療器材電磁相容檢測與可用性評估 (Electromagnetic compatibility (EMC) test)</p>				
<p>7</p>	<p>醫療器材電性安全檢測與實作-1 (Electrical safety testing for medical equipment-1)</p>				
<p>8</p>	<p>醫療器材電性安全檢測與實作-2 (Electrical safety testing for medical equipment-2)</p>				
<p>9</p>	<p>AI 在輔助診斷的應用-1 (Applications of AI in Diagnostic Assistance-1)</p>				

10	AI 在輔助診斷的應用-2 (Applications of AI in Diagnostic Assistance-2)
11-12	感測器實作-1 (Sensors Fabrication)
13-14	感測器實作-2 (Sensors Fabrication)
15-16	互動式智慧控制實作-1 (Developing interactive electronic objects-1)
17	秀傳醫療體系智慧病房與秀傳微創中心參訪 (Field Trip Program for Smart Hospital at Show Chwan Memorial Hospital)
18	互動式智慧控制實作 (Developing interactive electronic objects)-2

教科書與參考書目 (書名、作者、書局/代理商...)
textbooks & other references (title, author, publisher...)

1. Henry Baltes, Oliver Brand, Gray K. Fedder, Christofer Hierold, Jan G. Korvink, Osamu Tabata, *Enabling Technologies for MEMS and Nanodevices (Advanced Micro and Nanosystems)*, 2004, Wiley-VCH.
2. E. Meng, *Biomedical Microsystems*, 2010, CRC Press.

課程教材 (教師個人網址請列在本校內之網址)
teaching aids & teacher's website

Arduino, iLearning

課程輔導時間
office hours

另行公告