

Subject Description Form

Subject Code	SN5896
Subject Title	Concepts and Technological Applications of Smart Hospitals
Credit Value	3
Level	5
Prerequisite	Nil
Objectives	To equip students with a comprehensive understanding of Smart Hospitals within the context of the 4.0 industrial revolution. This includes an exploration of the information and communications technology (ICT) applications and implementation in smart hospitals; an examination of fundamental elements of smart hospitals; and a discussion on the challenges and opportunities, and ethical, legal and social considerations related to smart hospitals. The subject intends to facilitate students' modernized healthcare journey and enable students to create new value and insights into using ICT to improve patient-centered care.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. Critically analyze the concept, trends, significance and benefits of smart hospitals in healthcare delivery within the context of the 4.0 industrial revolution; b. explain the values and roles of ICT in smart hospitals; c. describe the fundamental elements of smart hospitals; d. evaluate the challenges and opportunities, ethical, legal and social considerations related to smart hospitals; and e. exhibit the ability to actively participate in smart hospital development.
Subject Synopsis/ Indicative Syllabus	<ol style="list-style-type: none"> 1. Introduction to Smart Hospital and the 4.0 Industrial Revolution: <ol style="list-style-type: none"> a. concept and transformation history of smart hospitals; b. status and trends of smart hospitals in Hong Kong and globally; c. significance and benefits of smart hospitals within the context of the 4.0 industrial revolution. 2. ICT in Smart Hospitals, including: <ol style="list-style-type: none"> a. location recognition and tracking technology; b. high-speed communication networks; c. the Internet of Things (IoT); d. mobile health; e. AI; f. robotics; g. extended reality; h. telehealth.

	<ol style="list-style-type: none"> 3. Elements of Smart Hospitals, including: <ol style="list-style-type: none"> a. “smart medical system (electronic health record system)” for medical staff; b. “smart service” for patients, including modernized healthcare service, customized patient service, smart logistics, and cutting-edge infrastructure; c. “smart management (digital transformation)” for hospitals. 4. Challenges and opportunities related to smart hospitals, including: <ol style="list-style-type: none"> a. safety; b. quality of care; c. data accuracy and validation; d. security and privacy; e. interoperability and standardization; f. market value. 5. Ethical, legal and social considerations in Smart Hospital.
<p>Teaching and Learning Methodology</p>	<ul style="list-style-type: none"> • Lectures Lectures are developed to introduce the concept and fundamental elements of smart hospitals in healthcare delivery; to provide basic knowledge of ICT employed in smart hospitals; as well as an examination of challenges and opportunities, and ethical and legal issues to adopt smart hospitals. • Case study/Tutorial Case studies of smart hospitals are provided to illustrate the current respective service types and transformation processes of smart hospitals, thereby reinforcing the fundamental knowledge discussed in the lectures. • On-site visits <i>Option one:</i> Smart Hospital Visits: To gain a comprehensive understanding of the present state of smart hospital development in Hong Kong, we will get in touch with the local smart hospital to schedule on-site visits. Students are provided with an invaluable opportunity to experience real-world scenarios in smart hospitals through the on-site visit, which serves to reinforce the knowledge they have learned in the classroom. <i>Option two:</i> We will have backup plans to set up visits to some of the smart hospital's technical applications at the university or school in case there are significant challenges with the on-site visits. Relevant laboratories and equipment in nursing school include: (1) An augmented reality system based on edge artificial intelligence for hand hygiene teaching; (2) Smart Aging Hub; (3) Humanoid social robots that students can interact with; and (4) Virtual reality-based innovative products. This hands-on experience enhances students’ understanding and helps bridge the gap between theory and practice. Additionally, the on-site visit provides an immersive learning opportunity that may encourage students to get involved in smart hospital initiatives. For the on-site trips, students

	will be divided into several smaller groups to ensure a sufficient learning experience. During group presentations, students will be expected to share their reflections from the on-site visits.						
Assessment Methods in Alignment with Intended Learning Outcomes	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
			a	b	c	d	e
	Individual Written Test	60%	√	√	√		
	Group Project (presentation and report)	40%	√			√	√
Total	100%						
	<p><i>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</i></p> <p>Individual written test: To assess students' level of understanding regarding the essential knowledge of smart hospitals and the fundamental concepts of the ICT employed in smart hospitals. Students are required to complete and pass the written test which consists of multiple-choice questions and short-answer questions for around 30 to 60 minutes. The intended learning outcomes of a,b,c can be examined from the individual written test.</p> <p>Group Project: To provide students with an opportunity to demonstrate their understanding of the knowledge gained from the lectures and their reflections on the on-site visits. Students are required to review the service types and ICT employed in smart hospitals, and they are encouraged to propose an innovation to address the healthcare challenges based on smart hospital concepts. Students also are required to submit reports to present detailed descriptions of the innovative solutions. The intended learning outcomes of a,d,e can be examined by the group project (including group reports and group presentations).</p>						
Student Study Effort Expected	Class contact:						
	▪ Lectures		24 Hrs.				
	▪ Case study / Tutorial		9 Hrs.				
	▪ In-class presentation		3 Hrs.				
	▪ On-site visit		3 Hrs.				
Other student study effort:							

	<ul style="list-style-type: none"> ▪ Preparation of individual written test 	32 Hrs.
	<ul style="list-style-type: none"> ▪ Preparation of group project 	24 Hrs.
	<ul style="list-style-type: none"> ▪ Self-directed study 	15 Hrs.
	Total student study effort	110 Hrs.
Reading List and References	<p><u>Reading List</u></p> <ul style="list-style-type: none"> ▪ Hartmann, M., Hashmi, U. S., & Imran, A. (2022). Edge computing in smart health care systems: Review, challenges, and research directions. <i>Transactions on Emerging Telecommunications Technologies</i>, 33(3), e3710. ▪ Levina, A., Iliashenko, V. M., Kalyazina, S., & Overes, E. (2022, May). Smart Hospital Architecture: IT and Digital Aspects. In <i>Algorithms and Solutions Based on Computer Technology: 5th Scientific International Online Conference Algorithms and Solutions based on Computer Technology (ASBC 2021)</i> (pp. 235-247). Cham: Springer International Publishing. ▪ Sebastian, M. P. (2019). Smart hospitals: challenges and opportunities. <i>Indian Institute of Management Kozhikode Working Papers</i>, 11. ▪ Heinemann, S. (2018). Smart hospital ethics–Starting the dialogue. <i>Health-Management. org</i>, 18(3), 174-177. ▪ 金新政，陳芸. (2019). 智慧醫院. 科學出版社. ▪ Legislative Council Secretariat. (2022). Promotion of smart healthcare in selected places. Retrieved Nov. 10 from https://www.legco.gov.hk/research-publications/english/2022rt06-promotion-of-smart-healthcare-in-selected-places-20220707-e.pdf ▪ News. Gov. HK. (2021). <i>Smart care for a smart city</i>. Retrieved Nov. 10 from https://www.news.gov.hk/eng/2021/09/20210930/20210930_105935_048.html ▪ Hospital Authority. (2022). Strategic Plan 2022-2027. Retrieved Oct. 18th from https://www.ha.org.hk/haho/ho/ap/HA_StrategicPlan2022-2027_Eng_211216.pdf ▪ Kowloon East Cluster. (2023). KEC Smart Hospital. Retrieved Oct. 18th from https://www3.ha.org.hk/uch/KECSmartHospital/SmartProjectList.html ▪ 經濟日報. (2019). 今年將力推醫院智慧服務分級. Retrieved Oct. 25 from https://www.gov.cn/xinwen/2019-03/22/content_5375850.htm ▪ NOVA National School of Public Health. (2023). Digital Health Executive Course. Retrieved Oct. 18th from https://www.ensp.unl.pt/courses/postgraduate-courses/digital-health-executive-course/ 	

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