

Subject Description Form

Subject Code	BME1D04
Subject Title	Skin-Care Technologies: Principles, Applications and Safety
Credit Value	3
Level	1
Pre-requisite / Co-requisite	Nil
Exclusion	Students from the Programme of Biomedical Engineering
Objectives	To introduce various skin-care technologies based on modern biomedical engineering technologies in med aesthetic clinics, beauty salons and at home, through which people can improve their appearance without any health benefit impairment. The focuses include: 1) To illustrate how modern biomedical engineering technologies deal with various skin-care issues such as body sculpting, hair removal, wrinkle removal, anti-aging, hair regrowth, acne treatment, wound healing, scar management and other skin problems, as well as the basics in skin biology; 2) To discuss ethical and safety issues related to skin-care technologies.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Describe a variety of biomedical engineering technologies, including devices, materials and agents currently applied in the skin-care industry. b. Understand the mechanisms of various skin-care technologies. c. Design and develop solutions to skin-care issues by applying different biomedical engineering technologies. d. Discuss societal, ethical and safety issues associated with skin-care technologies. In particular, this subject is intended to have the 3 required features of a CAR subject in the following aspects: <u>Higher-Order Thinking:</u> Different teaching approaches, such as case study, group discussion, lab session and group presentation will be used to help students foster their higher-order thinking capability. Students will learn to critically analyse skin-care issues; compare different skin-care technologies for their advantages and disadvantages; design and develop solutions for skin-care issues; discuss societal, ethical and safety issues associated with skin-care technologies.

	<u>Literacy:</u> Students will be given sets of reading materials, including book chapters, journal reports, news reports, videos, and will be asked to evaluate, discuss, and illustrate their understanding and thinking of the readings in group discussion. Students will illustrate their views on the recent development of skin-care technologies and related philosophical and ethical issues in the group presentation. <u>Life-Long Learning:</u> This interdisciplinary subject fosters a growth mindset in students that intelligence and creativity can be achieved by continuous learning. Also, it encourages them to form a habit of extracting and learning new things across their own disciplines.
Subject Synopsis/ Indicative Syllabus	The contents of this subject are derived from the instructors' teaching and research expertise in skin regeneration, anti-aging facial treatment, intradermal filter biomaterials, and bioinstrumentation for skin-care, wound healing and scar management from the interdisciplinary fields of biomedical engineering. Various skin-care technologies including light based therapy (laser, LED light and infra-red light), RF (Radio Frequency), electrical stimulation and ultrasound will be introduced. The applications of skin tissue engineering, transdermal drug delivery systems for skin care and scar management techniques will be included. The associated philosophical, ethical and safety issues will also be discussed. Indicative Subject Syllabus: Introduction and Overview • Basics in skin structure and functions; societal needs for skin-care technologies; brief history of skin-care technologies and industry; overview of current skin-care technologies. Skin-Care Instrumentation • Fundamentals of irradiation interaction with human skin • Light-based instrumentation (Laser, LED and infra-red light) for skin care • RF and electrical stimulation for skin care • Ultrasound for skin care Bio-technologies • Basics in skin tissue engineering • Transdermal drug delivery systems for skin care • Scar management techniques Health, Safety and Ethical Issues • The ethical issues of using animal models for skin care testing; issues about age, gender and race with skin care services; issues about selling skin-care services especially in Hong Kong; the cultural difference between Hong Kong and Mainland China • Regulation and safety issues of skin-care technologies • The trend of the future development of skin-care technologies Lab sessions

	1) Lab I Effect of face mist and mask on skin moisture 2) Lab II Effect of Radiofrequency (RF) treatment vs RF treatment & mask on skin tightening 3) Lab III Ultrasound for skin property measurement and demo of HIFU																																																																				
Teaching/Learning Methodology	<u>Lectures/Group Discussion/Lab:</u> the technologies and principles will be delivered through lectures, group discussions, Flipped classroom approach, and laboratories. <u>Group Presentation:</u> students will be grouped and choose one skin-care technology to discuss its advantages/disadvantages for skin-care applications and future development direction.																																																																				
Assessment Methods in Alignment with Intended Learning Outcomes	<table><tr><th rowspan="2">Specific assessment methods/tasks</th><th rowspan="2">% weighting</th><th colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th></tr><tr><th>a</th><th>b</th><th>c</th><th>d</th><th></th><th></th></tr><tr><td>1. FLIP activities</td><td>5</td><td>√</td><td>√</td><td></td><td>√</td><td></td><td></td></tr><tr><td>1. Test 1</td><td>15</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td></tr><tr><td>2. Test 2</td><td>25</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td></tr><tr><td>3. Lab sessions</td><td>30</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td></tr><tr><td>4. Group presentation</td><td>25</td><td></td><td></td><td>√</td><td>√</td><td></td><td></td></tr><tr><td>Total</td><td>100</td><td colspan="6"></td></tr></table> Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: FLIP activities will be arranged via learning management system (LMS) to perk student interest and prepare them before lectures and student understanding/learning will be assessed via online assessment activities. Two tests will be arranged during the mid-term and the end of semester, respectively, to assess students’ understanding of the lectures and reading materials related to intended learning outcomes a, b and c. Lab sessions will be used to assess students’ practical ability to achieve the intended learning outcomes a, b and c. Group presentation will be used to assess students’ ability to achieve the intended learning outcomes c and d.							Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						a	b	c	d			1. FLIP activities	5	√	√		√			1. Test 1	15	√	√	√				2. Test 2	25	√	√	√				3. Lab sessions	30	√	√	√				4. Group presentation	25			√	√			Total	100						
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Student Study Effort Expected	Class contact:	
	▪ Lectures	21 Hrs.
	▪ Group discussion/Group presentation	9 Hrs.
	▪ Laboratories	9 Hrs.
	Other student study efforts:	
	▪ Reading	74.5 Hrs.
	▪ FLIP activities before class	3.5 Hrs.
	Total student study effort	117 Hrs.
Reading List and References	• <i>Diagnostic Ultrasound in Dermatology</i> by Huixiong Xu, Lehang Guo and Qiao Wang, 1st Edition, 2022 • <i>Bioengineering of the Skin: Methods and Instrumentation, Volume III</i> by E Berardesca, P Elsner, KP Wilhelm and HI Maibach, 1st Edition, 2020 • Cios A, Ciepielak M, Szymański Ł, et al. <i>Effect of different wavelengths of laser irradiation on the skin cells</i>[J]. International Journal of Molecular Sciences, 2021, 22(5): 2437. • Zhang C, Song W, Yu B, et al. <i>Expert consensus on perioperative integrated skincare for noninvasive energy-based device aesthetic procedures in clinical practice in China</i>[J]. Journal of the European Academy of Dermatology and Venereology, 2024, 38: 26-36. • Ding Y, Zhang C, Xiang L F. <i>Application of integrated skincare in medical aesthetics: A literature review</i>[J]. Journal of the European Academy of Dermatology and Venereology, 2024, 38: 5-16.	