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 medaesthetic clinics, beauty salons and at home, through which people can improve their appearance and do not impair any health benefits. 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: **Higher-Order Thinking:** Different teaching approaches, such as case study, group discussion, lab session, group presentation and questionnaire survey report in med-aesthetic clinics/beauty salons, will be used to help students foster their higher-order thinking capability. Students will learn to critically analyze 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.

	Literacy: Students will be given sets of reading materials, including book chapters, journal reports, news reports, and will be asked to evaluate, discuss, and illustrate their understanding and thinking of the readings in group discussion. Students will also be required to write a report based on their surveys on current skin-care technologies used in med-aesthetic clinics and beauty salons in Hong Kong, and related ethnical/safety issues. Students will illustrate their views on the recent development of skin-care technologies and related philosophical and ethical issues in the report. **Life-Long Learning:** 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

<table>
<tr><td></td><td>Lab sessions
1) Lab I Ultrasound for skin property measurement and demo of HIFU
2) Lab II Effect of Radiofrequency (RF) treatment vs RF treatment & mask on skin tightening
3) Lab III Effect of face mist and mask on skin moisture</td></tr>
<tr><td>Teaching/Learning Methodology</td><td><u>Lectures/Group discussion/Lab</u>: the technologies and principles will be delivered through lectures, group discussion, 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.

<u>Reports</u>: students will be grouped to do surveys for currently used skin-care technologies and related ethnical/safety issues in med-aesthetic clinics, beauty salons and at home in Hong Kong. Based on the survey results, students are required to illustrate and discuss the development of skin-care technologies in Hong Kong in the reports. The related safety and ethical issues should also be discussed.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</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>30</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td></tr>
<tr><td>3. Lab sessions</td><td>15</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td></tr>
<tr><td>4. Group presentation</td><td>15</td><td></td><td></td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>5. Report</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>
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Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

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 and survey report will be used to assess students' ability to achieve the intended learning outcomes c and d.</td></tr>
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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/survey/report writing	78 Hrs.
	Total student study effort	**117 Hrs.**
Reading List and References	▪ *Lasers and Energy Devices for the Skin,* by Mitchel P. Goldman, Richard E. Fitzpatrick, E. Victor Ross, Suzanne L. Kilmer, Robert A. Weiss, 2nd edition, 2013 ▪ *Handbook of Skin Ultrasound, by* Dr. Fernando Alfageme, Dr. E Cerezo, 1st Edition, 2013 ▪ *Cosmetics Applications of Laser & Light-Based Systems,* by Gurpreet S. Ahluwalia, 1st Edition, 2008 ▪ *Skin Tissue Engineering and Regenerative Medicine,* by Mohammad Albanna and James H Holmes IV, 1st Edition, 2016 ▪ *Global Regulatory Issues for the Cosmetics Industry,* by Karl Lintner, 1st Edition, 2019	