Subject Description Form

Subject Code	BME42159
Subject Title	**Knee and Above-Knee Orthotics**
Credit Value	4
Level	4
Prerequisite and Co-Requisite	**Prerequisites** ABCT2334 Human Pathophysiology; and BME21301 / IC2135 Material Processing and Technical Communication; and BME21149 Biomaterials Science and Engineering; and BME32156 Pedorthics, Foot, and Ankle-Foot Orthotics **Co-Requisite** BME31125 Biomechanics
Objectives	This subject provides students with the principles and practical laboratory experiences in knee and above-knee orthotics. The series progressively integrate the health and engineering studies, which the students have taken as part of their academic studies. Those academic studies will form the basis for the derivation of the scientific principles used in the practice of knee and above-knee orthotics.
Intended Learning Outcomes	Upon completion of the subject, students will be able to carry out the following procedures, in a safe manner, according to the patients' conditions. a. To assess the patients b. To prescribe lower limb orthotic interventions c. To take measurement on the patients d. To design appropriate orthoses e. To perform the technical process f. To fit the orthoses g. To evaluate the intervention h. To communicate with the patients effectively

Contribution to Programme Outcomes (Refer to Part I Section 10)	▪ Programme Outcome 1: Demonstrate an ability to apply knowledge of mathematics, science, and engineering appropriate to the Biomedical Engineering (BME) discipline. (Teach and Practice) ▪ Programme Outcome 3: Demonstrate an ability to design a system, component, or process relevant to BME to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability. (Teach and Practice) ▪ Programme Outcome 4: Demonstrate an ability to identify, formulate, and solve BME problems. (Teach, Practice and Measure) ▪ Programme Outcome 7: Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for BME practice. (Teach and Practice) ▪ Programme Outcome 9: Demonstrate an ability to function in multi-disciplinary teams. (Teach) ▪ Programme Outcome 11: Demonstrate an ability to communicate effectively and advise clients, professional colleagues, and other members of the community. (Practice and Measure)
Subject Synopsis/ Indicative Syllabus	Detailed review of the relevant anatomy; relevant pathologies and lower limb disorders; biomechanics of lower limb orthotics; orthotic material and component options; assessment, prescription, measurement, design, plaster model rectification, fabrication, fitting, checkout and evaluation of lower limb orthotics including knee orthotics, knee-ankle-foot orthotics, hip orthotics, hip, knee-ankle-foot orthotics, walking aids and standing and walking orthoses for patients with paraplegic paralysis.
Teaching and Learning Methodology	The 21 hours of lectures and tutorials will be supported by 57 hours of clinical and laboratory teaching. The subject is to integrate the theoretical knowledge and the technical skills in a way that is important to patient care and management. In this module, students would have opportunities to interact directly with some professional patients. Students will need to go through step by step the clinical process of patient assessment, patient measurement, casting, plaster model rectification, fabrication, patient fitting, checkout and evaluation. Besides the development of technical skills, emphasis is placed on the development of clinical judgement and the process of clinical problem solving. Direct feedback from the professional patients/subjects at various stages, as well as from the instructors throughout the process, would constitute important inputs to the learning experience. In the process, subjects will learn how to interact with the patients and will be guided to critique the work of fellow students under the facilitation of the instructor. This is done to maximize the learning experience by learning not only from one's own mistakes but also from those of the fellow students.

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	f	g	h
1. Student presentation	10%		√		√				
2. Practical assignment	40%	√	√	√	√	√	√	√	√
3. Quiz	10%	√	√	√	√			√	
4. Final examination	40%	√	√	√	√			√	
Total	100%								

Note: To pass this subject, students must obtain grade D or above in both continuous assessment and final examination.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Each of the individual learning outcomes will be assessed as part of the integrated outcome demonstrated by the student in patient care. Individual orthotics design and fitting projects will be assessed with direct feedback from the professional patients/subjects at various stages, as well as from the instructors throughout the process. In the process, students will also learn how to interact with the patients. At the completion of assigned individual projects, students will be guided to critique the work of other fellow students under the facilitation of the instructor. This is done to maximize the learning experience by learning not only from one's own experience but also from those of the fellow students. A final examination will be used to establish that the student has understood and can integrate the factual materials required to provide knee and above-knee orthotics service.

Student Study Effort Expected	Class contact:	
	▪ Lecture	18 Hrs.
	▪ Tutorial	3 Hrs.
	▪ Clinical and laboratory teaching	57 Hrs.

	Other student study effort:	
	▪ Open laboratory practice	39 Hrs.
	▪ Written assignment and revision	39 Hrs.
	Total student study effort	156 Hrs.
Reading List and References	▪ Webster, J. B. and Murphy D.P. (eds.) AAOS. Atlas of Orthoses and Assistive Devices. 4th Ed. Philadelphia, PA: Elsevier, 2019. ▪ Krajbich J.I., et al. (eds.) Atlas of Amputations and Limb Deficiencies: Surgical, Prosthetic, and Rehabilitation Principles, 4th Edition. American Academy of Orthopaedic Surgeons, 2016. ▪ Chui K.C., et al. Orthotics and Prosthetics in Rehabilitation, 4th Edition. St. Louis, MO; Elsevier, 2020. ▪ Journal of Prosthetics and Orthotics ▪ Prosthetics and Orthotics International ▪ Gait & Posture ▪ Journal of Biomechanics ▪ Clinical Biomechanics	
Date of Last Major Revision	28 December 2021	
Date of Last Minor Revision	29 June 2023	