Subject Description Form

Subject Code	BME32104
Subject Title	**Below-Knee Prosthetics**
Credit Value	3
Level	3
Prerequisite and Co-Requisite	**Prerequisites** ABCT2331 Human Biology for Biomedical Engineering I; and ABCT2332 Human Biology for Biomedical Engineering II; and BME21119 Fundamentals of Biomechanics **Co-Requisite** BME31125 Biomechanics
Objectives	This is part of the lower limb prosthetics studies, which provides students with the principles and practical laboratory experience in the prosthetic management of below-knee amputees. The subject progressively integrates the health and engineering studies which the students have taken as part of their earlier academic studies, and which form the basis for the derivation of the scientific principles used in the practice of lower limb prosthetics of below-knee levels.
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 below-knee amputees' conditions. a. To assess the patients b. To prescribe prosthetic interventions c. To take measurement on the patients d. To design appropriate prosthetic devices e. To perform the technical process f. To fit the prostheses 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; causes and procedures of lower limb amputations, residual limb management; biomechanics of below-knee prosthetics; prosthetic material and component options; assessment, prescription, measurement, design, plaster model rectification, fabrication, fitting, checkout and evaluation of below-knee prosthetics including transtibial, ankle disarticulation and partial foot prostheses; CAD/CAM application in below-knee prosthetics.
Teaching and Learning Methodology	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 patients in the professional context. 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 patients/subjects at various stages, as well as from the instructors throughout the process, would constitute important input 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
Student presentation	20%		√		√				
Practical assignment	40%	√	√	√	√	√	√	√	√
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 below-knee prosthetics service.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture	18 Hrs.
	▪ Tutorial	3 Hrs.
	▪ Laboratory	39 Hrs.
	Other student study effort:	

	▪ Open laboratory practice	39 Hrs.
	▪ Written assignment and revision	39 Hrs.
	Total student study effort	138 Hrs.
Reading List and References	▪ Douglas G.S., et al. (eds.) Atlas of Amputations and Limb Deficiencies: Surgical, Prosthetic, and Rehabilitation Principles, 3rd Edition. American Academy of Orthopaedic Surgeons, 2004. ▪ Shurr D. and Michael J.W. Prosthetics and Orthotics. 2nd Edition. Upper Saddle River, N.J.: Prentice Hall, 2002. ▪ May B.J. Amputations and Prosthetics: A Case Study Approach. 2nd Edition. F.A. Davis, 2002. ▪ Weber D. Clinical Aspects of Lower Extremity Prosthetics: Trans-Tibial, Symes and Partial Foot Amputations, CAPO, Ontario, 1991. ▪ Seymour R. Prosthetics and Orthotics: Lower Limb and Spinal. Philadelphia: Lippincott Williams & Wilkins, 2002. ▪ Carroll K. and Edelstein J. E. (eds.) Prosthetics and Patient Management: A Comprehensive Clinical Approach. Thorofare, NJ: SLACK Inc., 2006. ▪ Lusardi M. M. and Nielsen C. C. (eds.) Orthotics and Prosthetics in Rehabilitation. 2nd Edition. St Louis, Mo.: Saunders/Elsevier, 2007.	
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