Subject Description Form

Subject Code	BME42137
Subject Title	**Upper Limb Prosthetics**
Credit Value	3
Level	4
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; and BME31121 Fundamentals of Biomedical Instrumentation II **Co-Requisite** BME31125 Biomechanics
Objectives	This subject provides students with the principles and practical laboratory experience in the prescription, design, fabrication, fitting, and evaluation of upper limb prosthetic devices. 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 clinical practice of upper limb prosthetics.
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 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	▪ Programme Outcome 1: Demonstrate an ability to apply knowledge of mathematics, science, and engineering appropriate to the Biomedical Engineering (BME) discipline. (Teach, Practice and Measure)

Part I Section 10)	▪ 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 9: Demonstrate an ability to function in multi-disciplinary teams. (Teach, Practice and Measure) ▪ Programme Outcome 10: Demonstrate an understanding of professional and ethical responsibility. (Teach, Practice and Measure)
Subject Synopsis/ Indicative Syllabus	▪ Review of the anatomy, biomechanics and pathomechanics of the upper limb; ▪ Use of assessment tools for recognizing normal and abnormal findings of the upper limb; ▪ Introduction to upper limb amputation; principles and concepts of clinical assessments of the upper limb amputee; ▪ Clinical reasoning in assessment, diagnosis, planning, implementation and evaluation of the upper limb amputation and management; ▪ Introduction to upper limb prosthetics and residual limb management; materials and components, and biomechanics of upper limb prosthetics; upper limb prosthetics for different levels, disorders and clinical conditions; ▪ The clinical assessment, documentation, measurement, moulding, cast rectification, fabrication; fitting, checkout and outcome measure of upper limb prosthetic services are included.
Teaching and Learning Methodology	The 21 hours of lectures and tutorials will be supported by 39 hours of demonstrations 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. Students will need to go through step by step the clinical process of patient assessment, patient measurement, casting, cast rectification, fabrication, patient fitting, and patient 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 inputs to the learning experience. In the process, students will also learn how to interact with the patients. At the end of a practical series, 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 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 presentations	10%	√	√		√			√	
Practical assignments	30%	√	√	√	√	√	√	√	√
Quizzes	20%	√	√	√	√			√	
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 prosthetics design and fitting projects will be assessed with direct feedback from the model 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 upper limb 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	▪ American Academy of Orthopedic Surgeons. Atlas of Limb Prosthetics: surgical, prosthetic, and rehabilitation principles. St. Louis, Mosby, 2002. ▪ Banerjee S.N. (ed.) Rehabilitation Management of Amputees. Williams and Wilkins, 1982. ▪ Bender L.F. Prostheses and Rehab after Arm Amputation. CC Thomas, 1974. ▪ Day H.J.B., Kulkarni J.R. and Datta D. Prescribing Upper Limb Prostheses. 1993. ▪ Hoppenfeld S. Physical Examination of the Spine and Extremities.1976. ▪ Kostuik J.P. Amputation Surgery and Rehabilitation: the Toronto Experience. Churchill Livingstone, 1981. ▪ Lusardi M. M. and Nielsen C. C., Orthotics and Prosthetics in Rehabilitation. Butterworth Heinemann, 2000. ▪ Murdoch G. (ed.) Prosthetic and Orthotic Practice. Arnold,1970. ▪ Northwestern University Medical School, Prosthetic-Orthotic Center. Upper Limb Prosthetics for Prosthetists. 2003. ▪ Robertson E. Rehabilitation of Arm Amputees and Limb Deficient Children. Bailliere Tindall, 1978. ▪ Spaeth J.P. and Klotz, J.S. Handbook of Externally Powered Prostheses for the Upper Extremity Amputation.1981. ▪ Vitali M., Robinson K.P., Andrews B.G., Harris E.E., Redhead R.G. Amputations and Prostheses. 2nd Edition. Bailliere Tindall, 1986. ▪ Shurr D.G, Michael J.W., Prosthetics and Orthotics. Prentice Hall,2002. ▪ Weiss-Lambrou R. A Manual for the Congenital Below-Elbow Child Amputee. 1981.	
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