

Subject Description Form

Subject Code	ABCT2334
Subject Title	Human Pathophysiology
Credit Value	3
Level	2
Prerequisite	ABCT2333 Human Physiology
Objectives	This course aims to introduce the basic concept and processes of human diseases to the undergraduate students of biomedical engineering for the effective communications / interactions across the biology, medicine and engineering disciplines.
Intended Learning Outcomes	Upon completion of the subject, students should be able to: a. Recall the basic anatomic and physiological knowledge obtained in Human Physiology (ABCT 2333); b. Understand basic processes of human diseases, and principles of clinical assessments and interventions; c. Connect the knowledge obtained in Human Physiology and Pathophysiology to articulate the major health-related problems and their altered physiological processes; d. Develop the inquiry and critiquing skills on current clinical practice.
Contribution to Programme Outcomes (Refer to Part I Section 10)	<ul style="list-style-type: none">▪ Programme Outcome 1: Demonstrate an ability to apply knowledge of mathematics, science, and engineering appropriate to the Biomedical Engineering (BME) discipline. (Teach)▪ Programme Outcome 2: Demonstrate an ability to design and conduct BME experiments, as well as to analyze and interpret data. (Teach and Practice)▪ Programme Outcome 4: Demonstrate an ability to identify, formulate, and solve BME problems. (Teach)▪ Programme Outcome 5: Demonstrate an ability to understand the impact of BME solutions in a global and societal context, especially the importance of health, safety and environmental considerations to both workers and the general public. (Teach)▪ Programme Outcome 11: Demonstrate an ability to communicate effectively and advise clients, professional colleagues and other members of the community. (Teach and Practice)

**Subject Synopsis/
Indicative Syllabus**

Module 1: Basic Disease Processes (week 1 to 5)

1. Define the basic terminology of pathophysiology in **injury, infection and cancer**, and the basic categories of disease by general mechanisms (genetic / developmental / degenerative) and specific causes (ischemic, infectious, immune, metabolic, trauma, idiopathic); describe basic diagnostic tools ranging from routine laboratory tests to advanced imaging modalities; discuss engineering innovations for better health (link with other BME subjects);
2. Articulate basic process of injury and repair, and compare reparative process among neuromusculoskeletal tissues (e.g. brain / spinal cord injury, fractures, dislocation, sprain and strains);
3. Understand the process of innate and adaptive immune responses to virus and bacteria infections.
4. Describe various processes of altered cellular growth including hypertrophy, hyperplasia, metaplasia, dysplasia and neoplasia, and appreciate the similarities and differences between the biological behaviors of benign versus malignant neoplasms;
5. Appreciate chromosomal abnormalities, single gene abnormalities and multifactorial inheritance as causes of disease e.g. cerebral palsy, Duchenne muscular dystrophy etc.

A blood laboratory session will be arranged to understand basic concept of diagnostic tests and results interpretation.

Module two: integrated organs / systems responses to stressors (week 6 to 9)

6. Iterate the functional anatomy of limbs and spine, and basic quantitative evaluations;
7. Discuss the adaptive responses of musculoskeletal tissues to the common stressors, i.e. diet and exercise, neuroendocrine regulation of calcium homeostasis, growth and remodeling of bone, and related diseases such as rickets and osteomalacia;
8. Explain maladaptive responses of musculoskeletal system to obesity and ageing e.g. sarcopenia, osteoporosis and osteoarthritis;

A histology laboratory session will be arranged to understand the pathological changes of musculoskeletal system post injury at organ, tissue to cellular levels.

Module three: Major organ-related diseases (week 10 to 13)

9. Develop the understanding of the following aspects of the major human diseases: incidence or prevalence, cause, clinical manifestations, diagnosis, treatment, prognosis.

In this module, we will discuss the prevalent neurodegenerative (e.g. Alzheimer's disease, Parkinson's disease), cerebro-cardiovascular disease (e.g. hypertension, ischemic heart disease and stroke) and metabolic syndrome (e.g. diabetes, obesity).

	A practical laboratory session will be arranged to understand neuromuscular junction.										
Teaching and Learning Methodology	<p>In the lectures and tutorials, the basic processes and terminology of common human diseases will be introduced in an integrated approach from molecular and cellular levels towards whole body level.</p> <p>Three laboratories will be arranged to provide students a unique hand-on experiences to understand adaptive and maladaptive responses.</p> <p>The guided reading of the textbooks will further extend students' knowledge in the respective areas. The outcome of self-study will be evaluated in the student report in lab sessions, tutorials, and quiz.</p>										
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			
	Laboratory session		20%		√	√		√			
	Quiz		30%		√	√	√	√			
	Final Exam		50%		√	√	√	√			
	Total		100%								
Student Study Effort Required	Class contact:										
	▪ Lecture / Tutorial									30 Hrs.	
	▪ Laboratory									9 Hrs.	
	Other student study effort:										
	▪ Preparation for quiz and lab session									18 Hrs.	
	▪ Self study (reading the references textbook books) and writing self-reflection essay									60 Hrs.	
	Total student study effort									117 Hrs.	

<p>Reading List and References</p>	<p><u>Compulsory reading materials</u></p> <ul style="list-style-type: none"> ▪ Introduction to Human Disease: Pathophysiology for Health Professionals (Seventh Edition) Edited by Agnes Loeffler and Michael Hart (e-Book available in PolyU Library) <p><u>Recommended reading materials</u></p> <ul style="list-style-type: none"> ▪ Pathophysiology introductory concepts and clinical perspectives edited by Theresa Capriotti and Joan Parker Frizzell (PolyU Library, RB 113.C243 2016) ▪ Atlas of Pathophysiology 3rd edition (PolyU Library, RB113.A83 2010 c.2)
<p>Date of Last Major Revision</p>	<p>30 June 2019</p>
<p>Date of last Minor revision</p>	<p>29 June 2023</p>