

## SUBJECT DESCRIPTION FORM

SUBJECT CODE: HTI4121

SUBJECT TITLE: Introduction to Transport Processes in Living Systems

CREDITS: 3 credits

PRE-REQUISITIES: HTI 2121 Intro to Biomechanics  
HTI 2122 Mechanics of Tissues and Biomaterials  
Or Equivalent

RESPONSIBLE DEPARTMENT: Department of Health Technology and Informatics

RESPONSIBLE MEMBER OF THE ACADEMIC STAFF:

Dr. Mo Yang

CONTACT HOURS:

Lecture 36 hours  
Lab 6 hours  
Total contact Hours: 42 hours

### RATIONALE:

This is an important subject in the field of biomedical engineering, covering fundamental principles in momentum transfer, heat transfer, and mass transfer. Understanding these processes is essential to the physics of life science. This subject underpins many applications in bioengineering product developments.

### LEARNING OUTCOMES:

Students upon completion of this subject are expected to:

1. Understand the basic principles governing the physics of momentum, energy and mass transfer in general.
2. To apply these basic principles to understand the phenomena of biotransports, particularly the circulatory system, the kidney, and the thermal exchanges with the environment.
3. To appreciate the development of microfluidic devices on biomedical engineering.

### SYLABUS:

Introductory Overview, Fluid Statics, Effect of Posture on Blood Pressure, Flow Description, Reynold's Transport Theorem, Conservation of Mass, Continuity Equation, Conservation of Momentum, Conservation of Energy, Bernoulli Equation, Blood Flow, Kinematics of Fluid Flows, Fluid Properties, Blood Rheology, Laminar Incompressible Flow, Poiseuille Flow, Fahraeus-Lindqvist Effect, Navier-Stokes Equation, Transport across Cell Membrane, Mass Transfer, Diffusion Flux, Fick's Law, Heat transfer, Heat Flux, Conduction, Convection and Radiation.

## TEACHING-LEARNING METHODS:

Lectures and Labs  
Tutorial on demand

## ASSESSMENT

Continuous assessment	60%
Final exam	40%

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

Text: Welty JR, Wicks CE, Wilson RE, and Rorrer G. Fundamentals of Momentum, Heat, and Mass Transfer. 4<sup>th</sup> Edition. Wiley, New York. 2001.

Highly Recommend References:

1. Fundamentals and applications of microfluidics Nguyen, Nam-Trung, Boston, MA: Artech House, c2006.
2. Fournier RL. Basic Transport Phenomena in Biomedical Engineering. Taylor and Francis, Philadelphia. 1999.