



## UNIVERSITI TEKNOLOGI MARA

### BIO566: INTRODUCTION TO BIOPHYSICS

<b>Course Name (English)</b>	INTRODUCTION TO BIOPHYSICS <b>APPROVED</b>
<b>Course Code</b>	BIO566
<b>MQF Credit</b>	3
<b>Course Description</b>	Biophysics is a multidisciplinary field that spans physics, chemistry, biology, mathematics and medicine. This course introduces the use of physical methods in the study of biological systems, including fluids biophysics, bio-membranes and bio-electricity, bio-mechanics, bio-thermodynamics and visual systems. The biological systems to which the methods are applied will be surveyed and current interpretations of their structure and function will be discussed. The treatment of biological phenomena will be based on physical principles with appropriate mathematics when necessary.
<b>Transferable Skills</b>	1. Ability to obtain and process information. 2. Ability to make decisions and solve problems. 3. Ability to analyze quantitative data.
<b>Teaching Methodologies</b>	Lectures, Discussion, Journal/Article Critique
<b>CLO</b>	CLO1 Define keywords and laws in biophysics. CLO2 Relate biophysics principles to living organisms. CLO3 Describe the current techniques in the area of biophysics.
<b>Pre-Requisite Courses</b>	No course recommendations
<b>Topics</b>	
<b>1. An Introduction to Biophysics</b> 1.1) 1.1 Definition of Biophysics 1.2) 1.2 Application of Biophysics 1.3) 1.3 The Study of Biophysics	
<b>2. Molecular Biophysics</b> 2.1) 2.1 Molecular Interaction 2.2) 2.1.1 Intramolecular Forces 2.3) 2.1.2 Intermolecular Forces 2.4) 2.2 Protein and Nucleic Acid Interaction 2.5) 2.3 Determination of Protein-Nucleic Acid Complexes 2.6) 2.3.1 X-ray Diffraction 2.7) 2.3.1.1 Bragg's Equation	
<b>3. Properties of Fluids</b> 3.1) 3.1 Density 3.2) 3.2 Pressure 3.3) 3.2.1 Pascal's Principle 3.4) 3.2.2 Measurement of Pressure 3.5) 3.2.2 Pressure and the Human Body 3.6) 3.3 Surface Tension 3.7) 3.3.1 Surface Tension In Alveoli 3.8) 3.3.2 Surfactant 3.9) 3.4 Viscosity 3.10) 3.5 Motion of Fluid 3.11) 3.5.1 Equation of Continuity 3.12) 3.5.1 Types of Blood Flow	

**4. Biophysics of Membrane**

- 4.1) 4.1 Biological membrane
- 4.2) 4.1.1 Components of Biological Membranes
- 4.3) 4.1.2 Transport Processes Across Biological Membranes
- 4.4) 4.2 Membrane Mediators
- 4.5) 4.2.1 Ion Channels, Uniporters, Symporters, Antiporters and Ion Pumps
- 4.6) 4.3 Diffusion of Ions
- 4.7) 4.4 Membrane Potential
- 4.8) 4.4.1 Electrical Properties of Membranes
- 4.9) 4.4.2 Resting Membrane Potential
- 4.10) 4.4.2.1 Nernst Equation
- 4.11) 4.4.2.2 Goldman-Hodgkin Equation
- 4.12) 4.4.3 Action Potential
- 4.13) 4.4.3.1 Depolarisation and Repolarisation
- 4.14) 4.4.3.2 Refractory Period
- 4.15) 4.4.3.3 Propagation of Action Potential
- 4.16) 4.5 Technique of Measuring Electrical Activities in Cells

**5. Biomechanics**

- 5.1) 5.1 Force
- 5.2) 5.2 Newton's Law of Motion
- 5.3) 5.2.1 Law of Inertia, Acceleration, Reaction
- 5.4) 5.2.2 Friction
- 5.5) 5.3 Types of Machines In The Human Body
- 5.6) 5.3.1 Lever
- 5.7) 5.3.2 Wheels and Axles
- 5.8) 5.3.3 Pulley
- 5.9) 5.4 Balance, Equilibrium and Stability

**6. Thermodynamic and Interconversions of Chemical Energy**

- 6.1) 6.1 Thermodynamic Laws
- 6.2) 6.2 Thermodynamic Equilibrium
- 6.3) 6.3 Thermal Capacity
- 6.4) 6.4 Entropy
- 6.5) 6.5 Enthalpy
- 6.6) 6.6 Free Energy
- 6.7) 6.7 Thermal Energy Exchange
- 6.8) 6.7.1 Conduction, Convection and Radiation
- 6.9) 6.7.2 Thermal Energy Transfer Equation
- 6.10) 6.8 Oxidation-reduction Reaction
- 6.11) 6.9 Reaction Velocity

Assessment Breakdown		%		
Continuous Assessment		100.00%		
Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Writing Assignment	15%	CLO3
	Quiz	Quiz	15%	CLO1
	Test	Test	70%	CLO2
Reading List	Recommended Text	<ul style="list-style-type: none"> <li>• Kirsten Franklin, Paul Muir, Terry Scott, Lara Wilcocks, Paul Yates 2010, <i>Introduction to Biological Physics for the Health and Life Sciences</i>, 39, Wiley [ISBN: 9780470665930]</li> <li>• Roy RN 2001, <i>A Textbook of Biophysics</i>, New Central Book Agency</li> <li>• Paul Davidovits 2008, <i>Physics in Biology and Medicine</i>, 3 Ed., 17, Academic Press [ISBN: 9780123694119]</li> </ul>		
	Reference Book Resources	<ul style="list-style-type: none"> <li>• Duane Knudson 2007, <i>Fundamentals of Biomechanics</i>, 2 Ed., 12, Springer Science &amp; Business Media [ISBN: 9780387493114]</li> <li>• Donald T. Haynie 2008, <i>Biological Thermodynamics</i>, 2 Ed., 9, Cambridge University Press New York [ISBN: 9780521884464]</li> <li>• Jack A. Tuszynski, Michal Kurzynski 2003, <i>Introduction to Molecular Biophysics</i>, 10, CRC Press New York [ISBN: 0-8493-0039-8]</li> </ul>		
Article/Paper List	This Course does not have any article/paper resources			
Other References	This Course does not have any other resources			