

## ADVANCED DIPLOMA OF BIOMEDICAL ENGINEERING

<b>MODULE DETAILS</b>	<b>MODULE 14: BIOMEDICAL MODELLING AND SIMULATION</b>
	<p>Nominal duration: 4 weeks (48 hours total time commitment)</p> <p>This time commitment includes the preparation reading, attendance at each webinar (1 hour plus 15-30 minutes for discussion), and the time necessary to complete the assignments and further study.</p>
<b>MODULE PURPOSE</b>	To provide the participants with the knowledge and skills required to develop mathematical models of organ systems and simulate using computer software tools.
<b>PRE-REQUISITES MODULE, UNITS / CO-REQUISITES</b>	<p>Module 3: Fundamentals of Professional Engineering</p> <p>Module 6: Anatomy and Physiology for Engineering</p> <p>Module 12: Software Programming</p>
<b>ASSESSMENT STRATEGY</b>	To evaluate the achievement of the learning outcomes; written assignments, group projects and practical exercises are set.
<b>SUMMARY OF LEARNING OUTCOMES</b>	<ol style="list-style-type: none"> <li>1. Outline the principles of mathematical modelling.</li> <li>2. Examine and discuss the software implementation of models.</li> <li>3. Examine and discuss simulation results and model validation</li> <li>4. Examine the applications requiring mathematical modelling and simulation in medical environments</li> </ol>
<b>Learning Outcome 1</b>	<b>Outline the principles of mathematical modelling</b>
<b>Assessment Criteria</b>	<ol style="list-style-type: none"> <li>1.1 Examine and discuss the essentials of biomedical modelling and simulation</li> <li>1.2 Describe the attributes of mathematical models for organs and systems</li> </ol>

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<b>Learning Outcome 2</b>	<b>Examine and discuss the software implementation of models</b>
<b>Assessment Criteria</b>	<p>2.1 Evaluate discretization of the continuous-time state equation.</p> <p>2.2 Examine and discuss basic algorithms for the implementation of discrete-time state variable models.</p> <p>2.3 Discuss the procedure for model code verification.</p> <p>2.4 Discuss the interconnection of state variable models.</p>
<b>Learning Outcome 3</b>	<b>Examine and discuss simulation results and model validation</b>
<b>Assessment Criteria</b>	<p>3.1 Outline the overall simulation process and related definitions</p> <p>3.2 Examine quantitative and qualitative methods for establishing accuracy.</p> <p>3.3 Examine the range of validity, target data and experimental conditions.</p>
<b>Learning Outcome 4</b>	<b>Examine the applications requiring mathematical modelling and simulation in medical environments</b>
<b>Assessment Criteria</b>	<p>4.1 Outline the requirements for cardio system modelling and simulation.</p> <p>4.2 Examine model requirements for simulation.</p> <p>4.3 Examine conceptual models for simulation.</p> <p>4.4 Examine mathematical models for simulation.</p>
<b>Delivery Mode</b>	
<p>A combination of asynchronous and synchronous e-learning delivery comprising a judicious mix of interactive online web conferencing, simulation (virtual labs) software, remote online labs, online videos, PowerPoints, notes, reading and study materials (in pdf, html and word format) accessed through the Moodle Learning Management System (LMS).</p>	