

## ADVANCED DIPLOMA OF BIOMEDICAL ENGINEERING

MODULE DETAILS	MODULE 13: EMBEDDED MICROCONTROLLERS
	<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>
MODULE PURPOSE	To provide the participants with the knowledge and skills required to develop embedded applications using integrate development environment tools.
PRE-REQUISITES MODULE, UNITS / CO-REQUISITES	<p>Module 1: Basic Electrical Engineering</p> <p>Module 3: Fundamentals of Professional Engineering</p> <p>Module 5: Printed Circuit Board Design</p> <p>Module 7: Power Electronics and Power Supplies</p>
ASSESSMENT STRATEGY	To evaluate the achievement of the learning outcomes; written assignments, group projects and practical exercises are set.
SUMMARY OF LEARNING OUTCOMES	<ol style="list-style-type: none"> <li>1 Examine and discuss the attributes of a typical microcontroller family</li> <li>2 Develop an assembler program for a microcontroller</li> <li>3 Demonstrate the ability to develop advanced programs for a microcontroller in assembler language</li> <li>4 Demonstrate the ability to develop microcontroller programs in a high-level language</li> </ol>
Learning Outcome 1	<b>Examine and discuss the attributes of a typical microcontroller family</b>
Assessment Criteria	<ol style="list-style-type: none"> <li>1.1 Examine and discuss the selected microcontroller in terms of its hardware structure</li> <li>1.2 Examine and discuss the selected microcontroller in terms of its programming instructions</li> </ol>
Learning Outcome 2	<b>Develop an assembler program for a microcontroller</b>
Assessment Criteria	<ol style="list-style-type: none"> <li>2.1 Write, assemble, simulate and upload a simple machine language program for the microcontroller.</li> </ol>

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<b>Learning Outcome 3</b>	<b>Demonstrate the ability to develop advanced programs for a microcontroller in assembler language</b>
<b>Assessment Criteria</b>	<p>3.1 Demonstrate the ability to develop assembler programs for the following:</p> <ul style="list-style-type: none"> <li>(a) Servicing interrupts</li> <li>(b) A/D conversion</li> <li>(c) Comparison</li> <li>(d) Switch scanning</li> <li>(e) Keypad scanning</li> <li>(f) LED display</li> </ul>
<b>Learning Outcome 4</b>	<b>Demonstrate the ability to develop microcontroller programs in a high-level language</b>
<b>Assessment Criteria</b>	<p>4.1 Demonstrate the ability to develop high-level language programs for the following:</p> <ul style="list-style-type: none"> <li>(a) LCD display</li> <li>(b) Stepper motor control</li> <li>(c) Servomotor control</li> </ul>
<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>	