

**COURSE ELT3080: MICROPROCESSORS****Level:** Advanced**Theme:** Computer Logic Systems**Prerequisite:** ELT2060 Digital Technology 2**Description:** Students compare the internal architecture of microprocessors and program them, using instruction sets.**Parameters:** Microprocessor trainer/CAI program and related resources.**Supporting Courses:** ELT3060 Digital Technology 3  
ELT3070 Digital Applications**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>compare the internal architecture of various families of microprocessors</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>explaining the difference in internal architecture between different families of microprocessors</li> <li>identifying and comparing the following functional sections in a microprocessor: <ul style="list-style-type: none"> <li>– accumulator</li> <li>– program counter</li> <li>– instruction decoder</li> <li>– controller</li> <li>– data register</li> <li>– address register</li> <li>– stack pointer</li> <li>– index pointer</li> </ul> </li> <li>drawing a block diagram of an advanced microprocessor showing its internal architecture.</li> </ul> <p><i>Assessment Tool</i> <i>ELT3080–1: Presentations/Reports:</i> <i>Microprocessors</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p>	20

**COURSE ELT3080: MICROPROCESSORS (continued)**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• program a microprocessor, using instruction sets</li> <li>• describe input/output operations in microprocessors</li> <li>• demonstrate established laboratory procedures and safe work practices</li> <li>• demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• writing and executing programs using mnemonic and op codes that complete the following functions:               <ul style="list-style-type: none"> <li>– branching</li> <li>– additions/subtractions</li> <li>– indexed and extended addressing</li> <li>– store data and retrieve data from the stack</li> <li>– loops</li> <li>– moving data between several places.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>ELTLAB–3: Assessment Checklist: Laboratory Practice, Parts 1 and 4</i></p> <p><i>Standard</i>  <i>Performance rating of 3 for each applicable task</i></p> <ul style="list-style-type: none"> <li>• writing and executing various programs that use memory input and output devices.</li> </ul> <p><i>Assessment Tool</i>  <i>ELTLAB–3: Assessment Checklist: Laboratory Practice, Part 1</i></p> <p><i>Standard</i>  <i>Performance rating of 3 for each applicable task</i></p> <ul style="list-style-type: none"> <li>• observed performance in following:               <ul style="list-style-type: none"> <li>– established laboratory procedures</li> <li>– procedures to avoid hazard of static electricity</li> <li>– procedures indicating awareness of high voltage requirements.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>ELTPSP: Assessment Checklist: Laboratory Procedures and Safety Practices</i></p> <p><i>Standard</i>  <i>Performance rating of 3 for each applicable task</i></p> <ul style="list-style-type: none"> <li>• observations of individual effort and interpersonal interaction during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>55</p> <p>20</p> <p>5</p> <p>Integrated throughout</p>

**COURSE ELT3080: MICROPROCESSORS (continued)**

Concept	Specific Outcomes	Notes
Safety/Resource Management	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• be aware of potential damage to integrated circuits by static electricity</li> <li>• be aware of current and voltage requirements of computer trainers</li> <li>• demonstrate proper safety procedures while testing microprocessor pins.</li> </ul>	
Fundamentals	<ul style="list-style-type: none"> <li>• compare the difference in internal architecture between different families of microprocessors</li> <li>• explain the differences between machine and assembly language, interpretative and compiler language</li> <li>• define the following terms:               <ul style="list-style-type: none"> <li>– microprocessor</li> <li>– input/output</li> <li>– instruction set</li> <li>– operand</li> <li>– mnemonic</li> <li>– opcode</li> <li>– data/address</li> </ul> </li> <li>• describe and locate the types of microprocessor used in a computer or trainer</li> <li>• identify input/output pins of a microprocessor</li> <li>• identify EPROMS, RAM ICs</li> <li>• identify memory read/write address and data pins on a memory chip</li> <li>• write and execute various programs that use memory, input and output devices</li> <li>• draw the symbols used in flow charting and explain the purpose of each</li> <li>• define and explain how the following are used in programming:               <ul style="list-style-type: none"> <li>– inherent, immediate and direct addressing</li> <li>– conditional and unconditional branching</li> <li>– stack operation/pointer, cascade, pop push/pull instructions</li> <li>– subroutines</li> <li>– carry, negative, zero, overflow, flag operation.</li> </ul> </li> </ul>	<p>Use Debug in DOS.</p>

**COURSE ELT3080: MICROPROCESSORS (continued)**

Concept	Specific Outcomes	Notes
System Identification	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• explain the purpose of the following functional sections in a microprocessor:               <ul style="list-style-type: none"> <li>– accumulator</li> <li>– program counter</li> <li>– instruction decoder</li> <li>– controller</li> <li>– data register</li> <li>– address register</li> <li>– stack pointer</li> <li>– index pointer</li> </ul> </li> <li>• explain the evolution of architecture from 8 bit on</li> <li>• draw a block diagram of an advanced microprocessor showing its internal architecture</li> <li>• identify differences between data address, instruction, flag registers</li> <li>• define a machine cycle</li> <li>• relate clock frequency to microprocessor speed.</li> </ul>	<p>The accumulation for math commands in older microprocessors can be used, newer ones can store math and logic commands in any register.</p> <p>Note: Address, data size, number of instructions, size of control set.</p> <p>Done at machine or assembler level programming.</p>
Real-world Applications	<ul style="list-style-type: none"> <li>• write and execute a simple straight program using mnemonic and op codes</li> <li>• demonstrate the uses and characteristics of different addressing modes by writing and analyzing assembly language programs</li> <li>• compute the proper relative address for branching forward or backward from one point to another in a program</li> <li>• write and execute a program that can, e.g.:               <ul style="list-style-type: none"> <li>– multiply by repeated additions</li> <li>– divide by repeated subtractions</li> <li>– convert binary to BCD</li> </ul> </li> <li>• write and execute simple programs that use indexed and extended addressing</li> <li>• given an instruction, locate the op code, calculate the number of machine cycles, find the number of bytes and give the final output</li> </ul>	<p>A microprocessor trainer is required.</p> <p>It may be necessary to purchase a micro-processor programming course to cover these SOs from one of the above or others. Also, using Debug in DOS from generic computers can be used.</p>

**COURSE ELT3080: MICROPROCESSORS** (continued)

Concept	Specific Outcomes	Notes
Real-world Applications (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"><li>• write and execute a simple program that can store data in and retrieve data from the stack</li><li>• write and execute a program that uses the stack and indenting registers to move data between two places.</li></ul>	
Careers	<ul style="list-style-type: none"><li>• research the curriculum of post-secondary institutions that teach microprocessor fundamentals</li><li>• research computer engineering, computer technologists and computer technicians occupations.</li></ul>	

